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Vol. 12 #8

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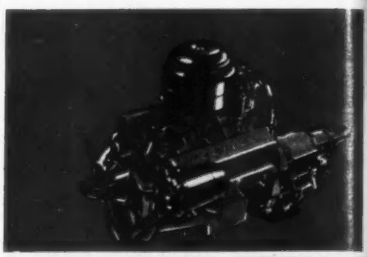

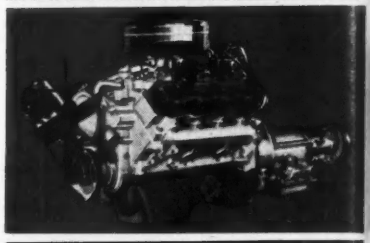

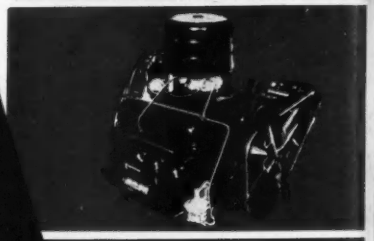

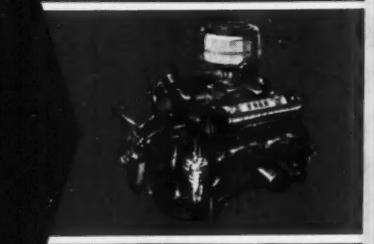

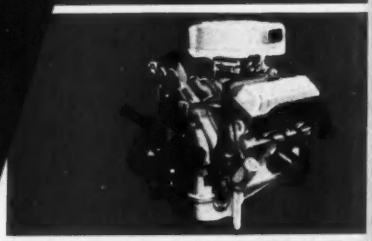

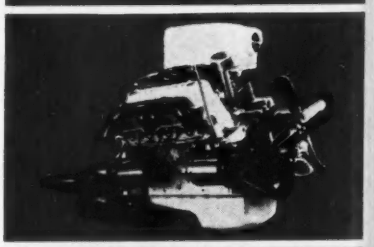

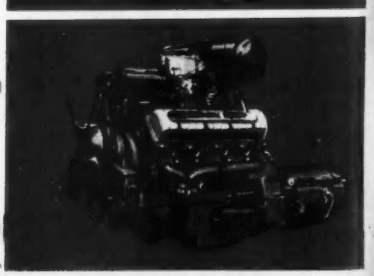

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MOTOR TREND

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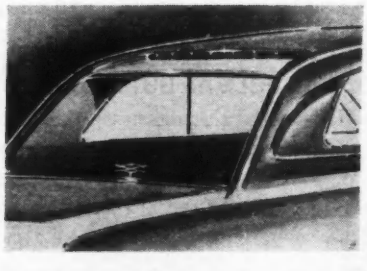

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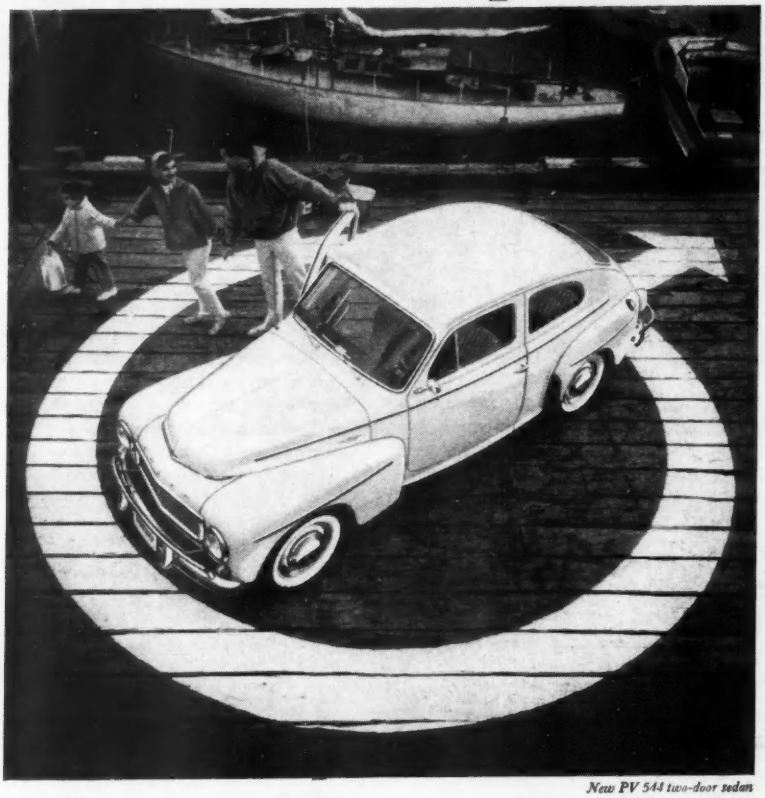
ON THE COVER:

Super Monza "dream" sports coupe, which may be forerunner of future Corvairs. Color shot by Art Emanuel. In upper photo, Don Edmunds (left) and Bob Strahlman lower big V8 engine into Falcon. Ektachrome by Eric Rickman.

Volvo is the sports car,



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MEMO FROM THE EDITOR

DON WERNER

IF YOU STOPPED TO LOOK at the table of contents on page four of this issue, you may have noted there's a new editor of MOTOR TREND. Just a few weeks ago, after 11 years of steering MT, Walt Woron decided to move on to other activities, and I was named to replace him.

Now since MT is the world's largest general motoring magazine, how it covers cars obviously is important. So perhaps it has been only natural that many people have asked me what, if any, changes might be made in the editorial content.

Yet I have been surprised. Any suggestion of change, to me, is absurd. I've been editor of other motoring magazines for nine years, nearly as long as Walt Woron was at the wheel here, and always regarded MT's areas of coverage as ideal.

So if it is necessary to say so, this is to assure you that MOTOR TREND *will not* change direction. It's going straight down the same road it has been traveling all these years. This magazine is dedicated to the Detroit car, the imported car, and any other cars of interest or significance whenever they turn up and wherever they may be.

With that settled, let's get on with the cars.

* * * * * *

The other day I jetted into Detroit to make another check on the 1961 car situation. The citadel of the car makers is boiling with hot news. Not only for the coming year, but the next year, and the years after that. What's happening ranges from the ironic to the intriguing. A couple of examples:

While I was there, General Motors, Ford and Chrysler sent their respective styling chiefs—Mitchell, Walker and Exner—to a local civic celebration to make the usual speeches. And so they talked, ambiguously as they have to, about the well-worn subject: the design of fantasy cars of the distant future.

Not on hand, however, was a representative of American Motors, the one car maker that has done the most to change the shape of cars, forced GM, Ford and Chrysler to conform—and flatly contradict in fact what the bigwigs were predicting in fiction only a few years ago. Detroit has as many prophets per acre as any place else and there, as everywhere, the true prophet apparently walks alone and unhonored. So much for the ironic.

They're saying in Detroit that Mercury is looking with green eyes at Dodge's fantastic success with the Dart. You can guess the rest yourself. The presumed plan is to drop Merc down into the big-car low-priced field, the class it has been edging toward anyway. Then, like Dart, it'll compete directly with Ford, Chevy, Plymouth and Rambler. And Detroit's game of musical chairs goes on and on.

* * * * * *

Rather than jet from Detroit back to California in four hours, I elected to spend four days on Route 66. What really influenced me was the chance to cover the route (which by now I know as well as main street in my hometown) in a Dodge Matador wagon. I particularly wanted to compare the wagon with the flock of sedans I've pushed west.

Well, it rained from Toledo to Tulsa and then strong winds (what else!) across Texas to Albuquerque. The wagon handled better than any sedan in both wet and wind. The engine was 361 cubic inches with a two-barrel linked via the three-button TorqueFlite to a 3.31 axle. Odometer error was two per cent and, after correcting, the mpg average for 2550 miles was 14. My average time on many hundred-mile stretches was 75 mph. It was the best car I've ever had on Route 66, bar none.

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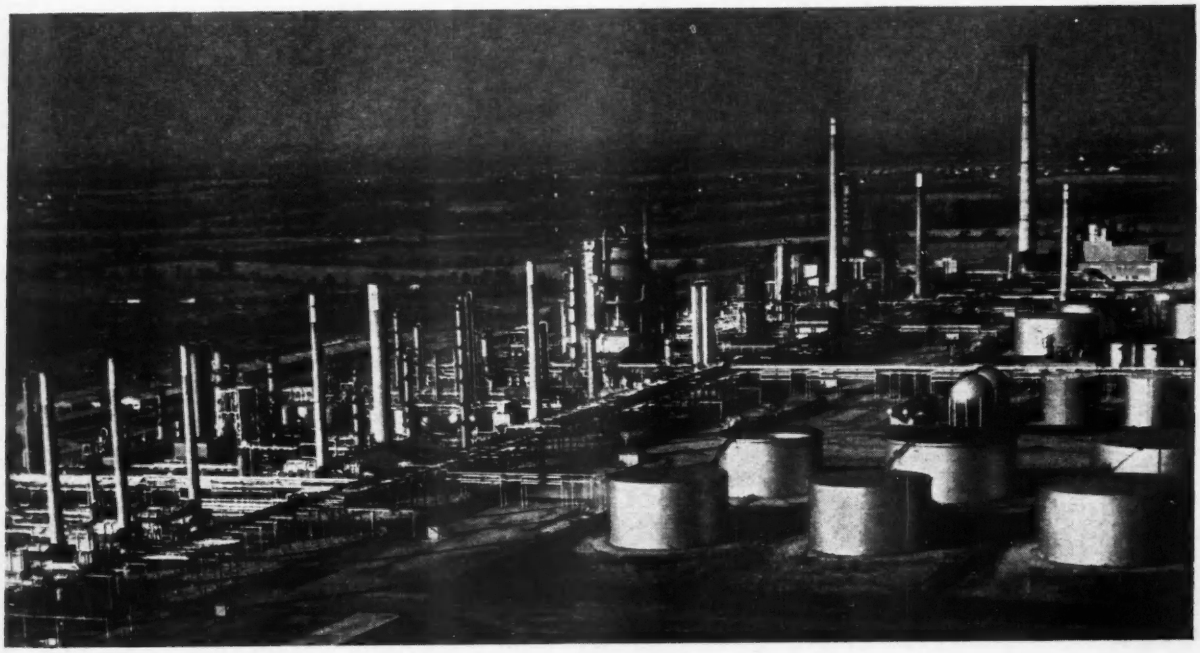

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FLYING A GASOLINE

TIDEWATER OIL COMPANY—*FORMERLY TYDOL*

Here's the "World Series" of drag racing

Officially, it's the "National Championship Drag Races." It's where the hot rodder's proudest title—"Mr. Eliminator"—is earned. Here's a preview of the 1960 National Drags, taken from the 1959 contest in which most of the titles, including "Mr. Eliminator," were won with Champion spark plugs . . .

The idea of a drag strip race is simple. It's to see how quickly a car can go from a standing start to a line exactly a quarter of a mile away. Rapid acceleration is far more important than final top speed. Preparing a car to win a drag race is anything but simple. It demands mechanical skill, imaginative engineering, money, and hundreds of hours of work.

Winning takes a smart, skillful driver, too. A drag race is no place for a driver who loves a squealing, slipping start that leaves rubber on the road. That can waste half a second—and victory is usually measured in hundredths of a second.

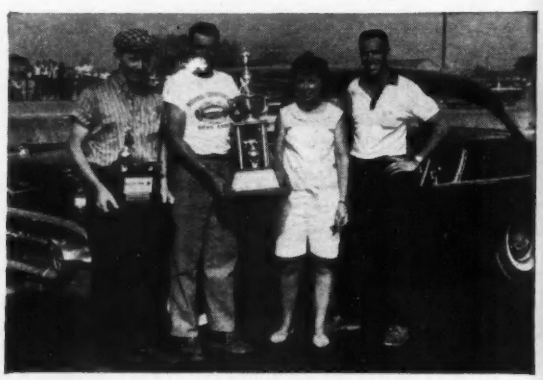
It's neither a "rich man's sport" nor a "poor man's sport." It's a sport for all who have the necessary qualities of creative imagination, mechanical know-how, manual skill, and the all-important will to work.

To give everyone a chance, there are many classes—for everything from slightly modified stock cars to "dragsters," cars built from the ground up to be nothing but a mechanical quarter horse for that quarter-mile straightaway.

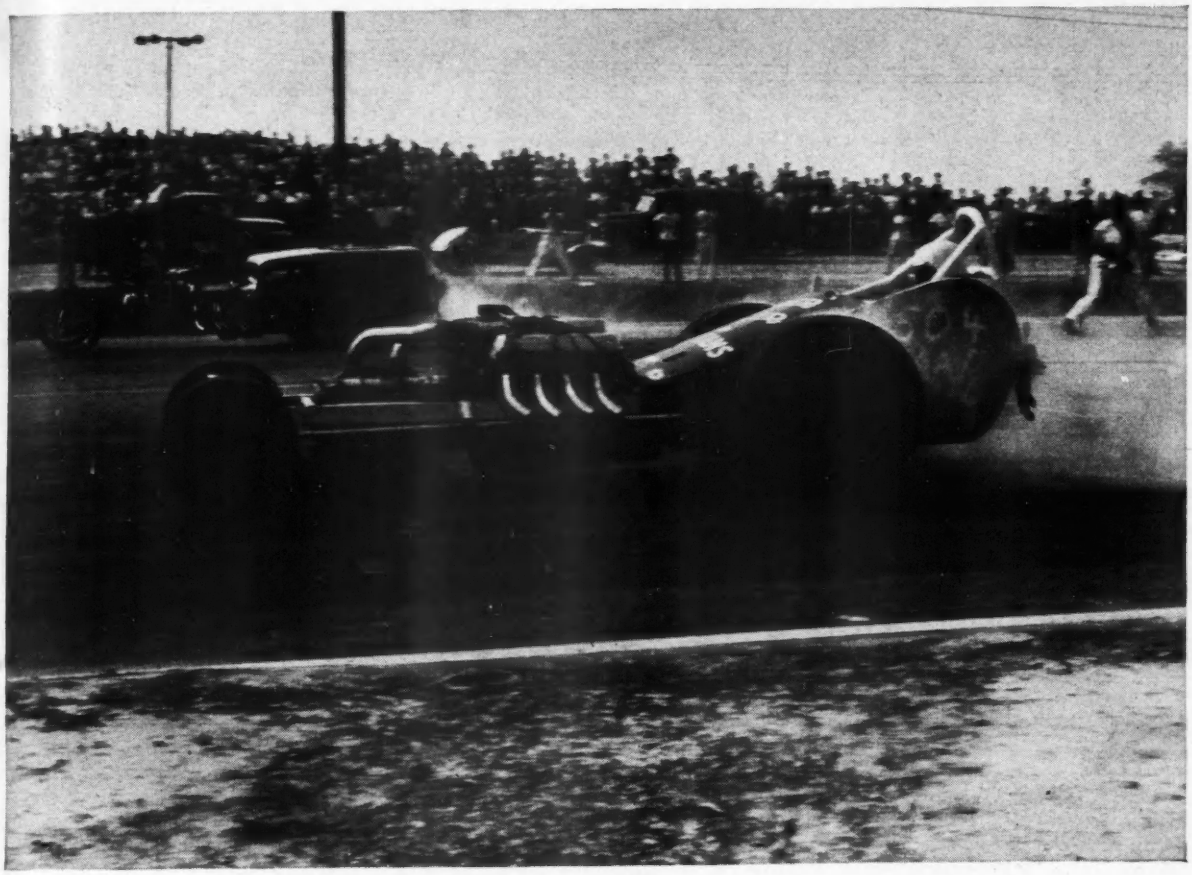
Winners at the National Drags know a lot about squeezing *more* than "maximum" performance from automobile engines. Like engine experts in other fields, most of them—including the Top Eliminator, Middle Eliminator, Sports Eliminator, and Stock Eliminator—choose Champion spark plugs. They know too that every engine does its best with the speed-world's favorite spark plugs—dependable Champions.

Here's the most sought-after of all drag racing trophies—the Champion Spark Plug Trophy—awarded to the Top Eliminator at the National Drags. The winner is decided by a series of two-car elimination runs. Reach the line second and you're out. Left to right: "Mr. Eliminator" of 1959, Rodney Singer of Houston, Texas; Trophy Queen Glynanna Ham; Karol Miller, Co-Owner and Crew Chief of the winning car.

Otis Smith, of Akron, Ohio, wins title of Middle Eliminator in his Class A Roadster with an elapsed time of 10.73 seconds. His Champion-equipped '57 Chrysler mill moves the 1923 Ford body to a top speed of 148.27 mph.



Harold Ramsey of Wilmington, Del. (*second from left*), used Champion J-8's in his '57 Chevrolet, hit 84.11 mph with e.t. of 15.55 seconds to become Stock Eliminator. The '59 National Drags again prove that every engine does its best with Champions.



Rodney Singer's Class AA Dragster takes off on the run that made him Top Eliminator of the National Drags, with the coveted title of "Mr. Eliminator." His Champion-sparked, blown '58 Lincoln engine shot him through the quarter mile in just 9.76 seconds, reaching a top speed of 152 mph!

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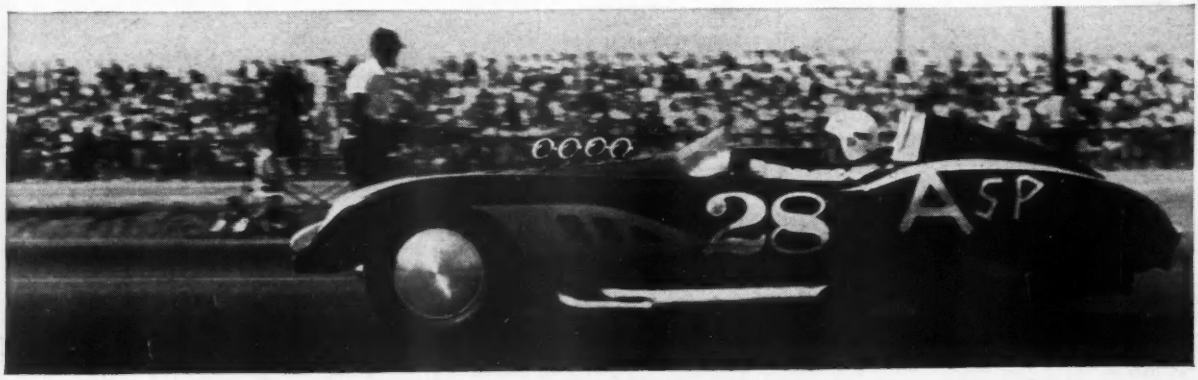

In the new Sports Class, Jack Horsley of Miami, Florida, becomes Sports Eliminator with an e.t. of 12.72 seconds. His speed was not recorded. (In some cases the car with the higher top speed loses, because of poor initial acceleration.) Horsley's 1959 Devin body is powered by a '58 Lincoln mill equipped with Champion spark plugs. Said Horsley, "We used Champions because our experience was disappointing every time we experimented with another make."

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PHONEY STOCKS

Gentlemen:

Here is my idea of a real Economy Run ("Light Foot Forward," June MT): Choose a stock car. Then, seal everything, allow no tune-up—only a 500-mile break-in, manufacturers' recommended grade of oil for oil change, no grease change—then make the Run under USAC rules.

This way, it might tend to make the auto manufacturers improve their assembly, and then it could be a benefit to the average auto owner. The way it is, the Economy Run doesn't prove anything except, like the Stock Car Races, it only shows what can be done to and with a so-called stock automobile—but then, the auto is no longer stock in my dictionary. Of course, nothing like this will ever happen because you wouldn't come anywhere close to the fantastic mileage that the present Economy Run cars average.

My gripe with Economy Run and Stock Car Races is this: Why call them "stock" cars when they are not? To me, a car is stock when it comes off the assembly line, or when delivered by the dealer to the customer. Anything done to a car after that makes it not stock, in my book.

That's what I like about the Indianapolis 500—no farce about the cars being "stock."

J. Ernest Lewis, Jr. Liliam, Va.

$14,000—AND NO HUBCAPS?

Dear Sir:

In looking through the June MOTOR TREND, my eye was caught by "A Bubble and a Gate."

What's the matter? Are the people at the Cadillac Division too poor to put hubcaps on their new "Estate Carriages," or is the price so high that people can't afford to buy hubcaps for their wagons? Excuse me—I mean "Estate Carriages."

Don't you think $14,000 is a little too much for a station wagon? If I want a wagon I can get many other makes for much less—and I think other folks will agree.

Arthur E. Deerheim Sprague, Wash.

The hubcaps, which were removed during the reworking operations, had not been replaced for the "informal portrait."—Ed.

RIDICULOUS CUSTOM

Sirs:

Reading the June issue of MT, I was rather interested in the article, "Customized Compacts."

The question/complaint is *why?* The Corvair which you have "customized" was rather ridiculously done. These models will obviously influence many people. Since all new parts are bolt-on, many people are going to be tempted to copy this model.

Why all the phoney junk? The exhaust system on the Corvair is already in the rear, where it should be; why waste time, money, etc. to bring it up forward? Why not try to design a system on the idea of the Abarth free exhaust, which would look good and would give better performance and economy than lake pipes.

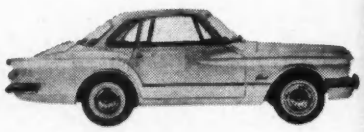
Why a phoney grille with a rear-mounted engine? Why not try to design a more practical auto, instead of . . . that!

Lee Evan Howard Chamblee, Ga.

VALIANT "SPORTS COUPE"?

Editors:

If the Chrysler Corp. is planning to get into the "sports-personal" car field, it looks to me that they have a simple solution. By cutting 16 inches out of the middle of their Valiant sedan they would have a beautiful 90-inch-wheelbase sports coupe.



In fact, I'm tempted to get out the cutting torch and try it.

James W. FitzGerald Palo Alto, Calif.

HOW ARE THINGS IN EBOLOWA?

Dear Sir:

Cameroun is a country about 1500 kilometers (937 miles) long, with only 300 km (187 miles) of asphalt roads.

I have been using a Volvo 60-hp station wagon, and so far it has stood up well. It is rugged, has plenty of power on regular gas, has good ground clearance, low gasoline consumption, and will still carry a useful load. I have oversize 6.40 x 15 tires on it.

Our six-week rainy season is a real test for any car. The weight distribution provides excellent traction under the slipperiest conditions, and the short overhang at the back keeps it from getting hung up easily.

Mercedes-Benz trucks stand up the best out here, followed by Ford and Chevy. Land Rover has left Willys completely behind, probably 10 to 1, because of the lower gas consumption, more rugged frame and body, and the diversity of models available. The new DKW Jeep is now being imported in large numbers and people are pleased with them.

Duty here is 20 per cent for commercial vehicles and 35 per cent for passenger cars. However, it is assessed on the combined cost of vehicle from the dealer or factory, *plus* the cost of ocean freight. This means that American imports are really expensive, since ocean freight is more than twice as expensive from the U.S. as from Europe. When you add the customs to this, it really adds up.

Many European vehicles are available only with 13-inch wheels. These are too

continued on page 12

EVERY DROP OF MOBIL DELIVERED TOP POWER IN THE INDIANAPOLIS "500"!

Power and speed were fine at Indianapolis. And that's what specially designed Mobil fuels delivered to the big racers. But you want something more for your car. You want economy. And who can deliver that kind of economy? Mobil, of course. And that's not just a promise. That's a proven fact. Yes, proved in the Mobilgas Economy Run, where 56 cars, (one of them just like your own) averaged 21.23 miles per gallon using Mobil, the New Car Gasoline! They traveled over 2000 miles. They covered every kind of driving you experience in a year. It's down-to-earth, honest-to-goodness proof of gasoline economy. The only kind like it in the world. Check the mileage *your* car delivers with Mobil, the New Car Gasoline.

You're Miles Ahead with Mobil!

Mobil

What a problem! Evaluating all the claims made by oil companies, and deciding which lubricants will do the best job in *your* car.

And what a problem for the oil company, too. Because, short of sending every customer a vest-pocket laboratory, it's pretty hard to *prove* you've got the best product on the market.

D-A offers two giant steps in the right direction:

1. An interesting, semi-technical pamphlet explaining the benefits D-A has engineered into D-A Speed-Sport Oil and D-A Speed-Sport Gear Lube. It's yours *free* for the asking.
2. A unique claim: YOU CAN *HEAR* THE DIFFERENCE!

Find out . . . TODAY.

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D-A LUBRICANT CO., INC.
1331 West 29th Street
INDIANAPOLIS 23, IND.

Letters

continued

small for our rutted and pot-holed roads and rule out the use of such cars as Opel, Taunus, Austin, etc. except for city driving only. An exception here is the VW, with its 15-inch wheels.

Roy P. Strange — Ebolowa, Cameroun West Africa

FINALLY ON RIGHT TRACK

Gentlemen:

The "Sloppy Three" are on the right track—thanks to American Motors. But I suppose with the jukeboxes and space ships brought out in the last few years, it must be very difficult for them, especially GM, to adjust themselves to building cars for the people of today on this planet.

At last the companies have awakened, and as can be seen by the sales successes of their latest efforts the public hasn't been entirely brainwashed and can still tell a good thing when it sees it.

Ronald L. Steeves — Moncton, N. B., Canada

THE SERVICEMAN'S VIEW

Gentlemen:

I would like to state a few facts concerning American car sizes in relation to the American serviceman.

As an example, I will take my squadron, which can be duplicated anywhere in the Air Force, Army or Navy.

First of all, if a serviceman buys an American car (not a compact) and takes it overseas it costs roughly ¼ to ⅓ more to run than in the States. This extra cost is for increased insurance rates, gas and minor repair jobs and/or preventive maintenance.

My squadron consists of 67 men. Of these 67, 39 own cars, and of the 39, 22 are compacts (15 Ramblers, three Larks, four foreign).

I have privately interviewed all 22, and all but one agree on this one point—they bought compact cars only out of necessity and would buy other makes if they were of decent size, get better mpg and had slightly lower horsepower. We all agree cars of 1953 and 1954 vintage were of adequate size, comfortable and just slightly under on hp.

Instead of building compact cars, why couldn't car manufacturers build new, up-to-date designs around '53 and '54 size cars?

M/Sgt Robert Shaw — Washington, D.C.

$3000 GAS CHAMBER?

Dear Sirs:

When a person buys a $3000 automobile he generally expects the exhaust system to be sound in design and engineering. Why, then, is American Motors producing station

wagons that cannot be driven with the rear window rolled down without inhaling deadly fumes? I have heard several complaints from 1960 Rambler wagon owners—this is their major gripe.

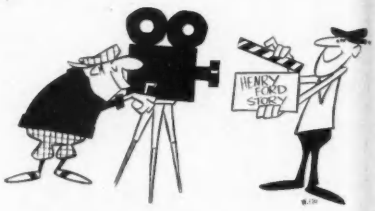
I notice that General Motors' station wagons have their exhaust discharging in front of the rear wheel. I think that this might be a way for American Motors to solve their problem. AM would have a pretty trouble-free automobile with this problem remedied. The exhaust problem is the only complaint I have heard from numerous Rambler and Ambassador owners.

Ray Hatfield — Tempe, Ariz.

"THE HENRY FORD STORY"?

Gentlemen:

In a country such as the United States, where the auto industry has been increasing in importance for over 50 years and where interest in cars generally ranges from enthusiastic to fanatic, doesn't it seem odd that the motion picture people haven't shown more interest in a comprehensive view of the auto industry? Here is excellent material for motion pictures!



I doubt if our dubious Western heroes of the past have done more to make and shape this country than has the auto industry —and yet, observe who draws all the attention.

Why haven't the lives of Henry Ford and Ransom Olds been put on film? Why hasn't the industry as a whole been studied and glamorized? I think the public would judge these offerings to be exciting and interesting.

John Bersch — Sheboygan, Wis.

CLUBS, ANYONE?

Dear Sir:

A Jeepster Owners Club has recently been formed in the Capital District area of New York State which we believe to be the only club of this marque on the East Coast, and possibly in the country. While the club was formed along the lines of a sportscar club, foremost in our minds is the preservation of the marque.

We extend an invitation to all owners of the Willys Jeepster to become associated with the New York club. Membership is also extended to K-D owners.

G. Luther Jones, Chairman — P. O. Box 448
Jeepster Motor Sport Club — Latham, N. Y.

Gentlemen:

You may be interested to know that a Lincoln Owners Club has been formed to assist in the preservation and restoration of Lincolns made between 1921 and 1940. The club has monthly publications and a membership of over 125 enthusiasts.

Ownership of a Lincoln is not required for membership—only an interest in Lincolns, including Models L, K, KA and KB and those made by Leland (but not including the Continentals).

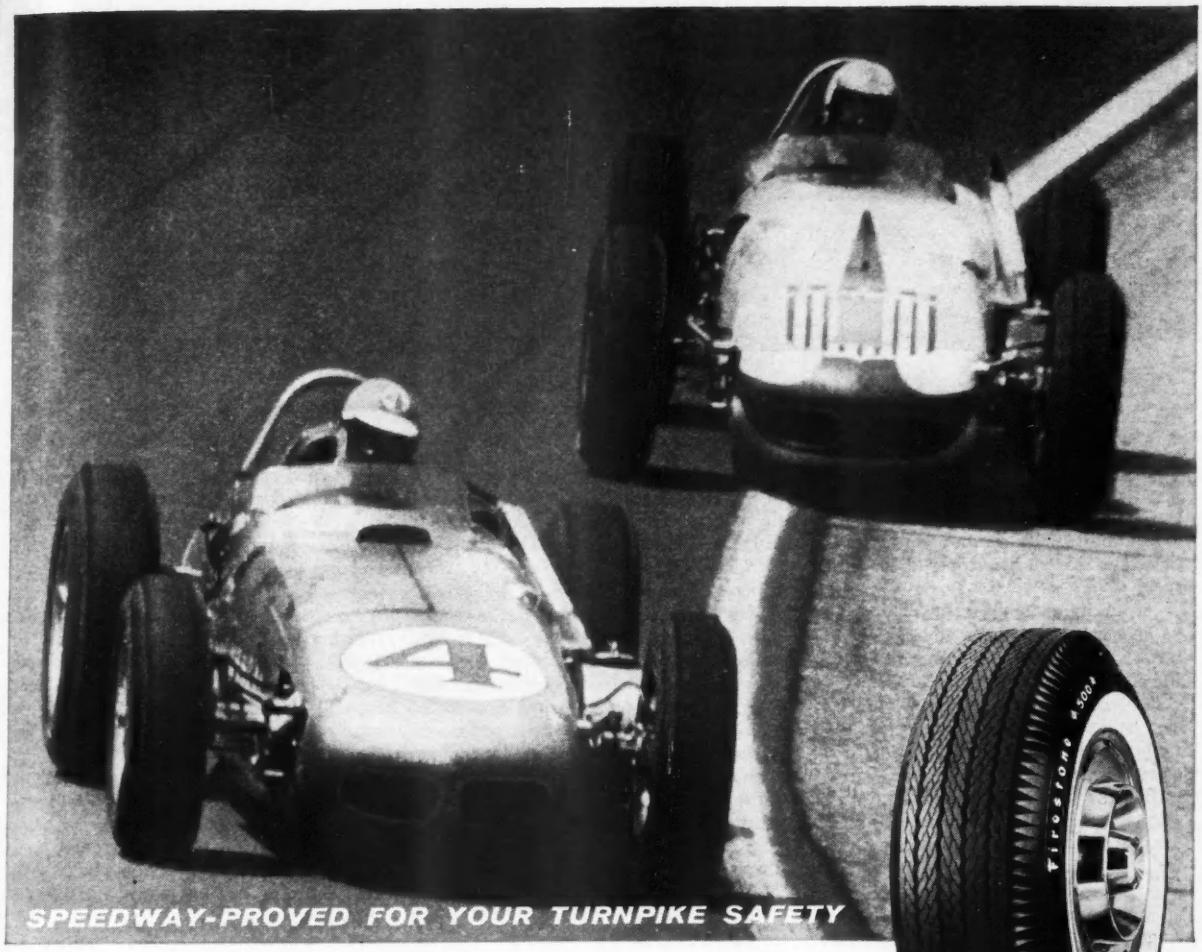
Anyone interested in joining is urged to write to Dr. J. Miles O'Brien, 735 Clinton Ave., Bridgeport, Conn.

D. W. Price Jr. — Bridgeport, Conn.

Dear Sir:

A Kaiser-Frazer Owners Club has recently been formed. The president is Thomas S. Rankine, 32121 Thorncrest Dr., St. Clair Shores, Mich.

D. Koert — Davenport, Iowa



FIRESTONE TIRES WIN 37TH STRAIGHT INDIANAPOLIS "500" RACE!

New Firestone Nylon "500"®

MEMORIAL DAY, 1960—INDIANAPOLIS SPEEDWAY. Jim Rathmann, this year's winner at 138.767 m.p.h. average speed, says: "The man at the wheel is no safer than his tires. That's why I depend on Firestones—not only on the track, but on the turnpikes, too." For the 37th consecutive time, the "500" winner streaked "home" on Firestone tires: proof again that the men who know tires best choose Firestones . . . champions in every test of tire safety! It takes Firestone tires to win the "500." And it takes Firestone leadership in speedway research to bring you top safety in the tires that carry you over the nation's turnpikes. Take the new Nylon "500," for instance. With Firestone Rubber-X-101 and Firestone's own Safety-Fortified nylon cord, this tire offers you greater safety at high speeds . . . plus quicker, quieter stops and starts . . . plus up to 35% more mileage. Buy Firestone Nylon "500" tires, on convenient terms if you wish, at your nearby Firestone Dealer or Store.

Firestone

BETTER RUBBER FROM START TO FINISH

Copyright 1960, The Firestone Tire & Rubber Company

by Don Stewart

THE **"PERFORMANCE BUTTON"** has been pushed again and right now Detroit is a-building and a-planning and a-scheming for more usable torque and horsepower in chassis that corner closer to the inside curb!

Such activity doesn't necessarily have to be interpreted as direct violation of the industry-sanctioned AMA curb on motoring competition. In fact, except for a short period right after the self-imposed legislation became effective in June, 1957, there never has been any real let-down in interest (or participation) by the factories.

But the recent experimentation by at least four of the major car makers in this area would indicate a real strong push is on for the development of quicker products.

What has prompted Detroit to re-emphasize the word "speed" and do something about it? Simple! It sells cars! The increased participation in drag racing, the apparent large interest in sportscar racing, the televising of international motoring events, even the jet age symbols and a host of other such things have compounded themselves to form an image in the minds of Detroit's marketing folk. This image has manifested itself into the need for faster, better performing vehicles.

The few thousand cars that a maker sells throughout the year to drag racing enthusiasts, for instance, don't make a great deal of difference in the "big" picture. But, those same limited number of vehicles, when they consistently perform in a manner superior to other nameplates within their price class, emphasize that make's overall superiority. And, that sort of thing prompts a great many non-competitors to go out and buy the make that's proven itself in competition with other cars.

And so it goes. Everybody likes a winner —and winners, *more* winners, are in the planning stages right now in the engineering lofts and the experimental garages of Ford, General Motors and Chrysler.

As an example, rumor has it that a three-speed, close-ratio floor-shift model will bow in the Chrysler Windsor next year. We've already reported on Ford's increased horsepower for 1961 (390 hp) and also the development work on a floor-mounted four-speed box. Ford also has recently released a three-carburetor manifold for the dragstrip enthusiast (June 15, 1960), and the AMA specification sheets on the Ford, Falcon and Mercury will include a raft of axle ratio options (just so they won't get caught short like they did at Daytona Beach last February).

In the GM groups there is also activity. That there is a real quick experimental version of the Corvair is no secret. The compact, in its final form à la Duntov, is a screamer! It's reported to corner like the proverbial freight train with a 0-to-60 mph time of about 9 seconds and a top-end speed of over 125 mph—which may be put down for the record as real progress from the 140-cubic-inch ohv powerplant.

Then there's the matter of the big Chevy—a car that's been put down slightly

Since introduction of the Ford Falcon Ranchero, compact trucks have gained new popularity with both sportsmen and commercial users. Industrial designer J. William Mason thinks that the compact truck of the future will incorporate the low silhouette. This picture demonstrates how he thinks a highly styled forward cab model might look.

this year by the hairy Fords and the big brave Pontiacs. Right now there are two possibilities for 1961, a 360-cubic-inch engine *and/or* a 389-cubic-inch unit—both probably limited-production units with mechanical valve trains and horsepower ratings over 350.

There's also going to be a weight reduction next year in this make (and the other GM units) which will not only increase the dragstrip potential but will also make NASCAR drivers happy. Pontiac also has plans, though they aren't making them known just right now.

The new Tempest should eat up Valiants if, and when, the NASCAR Compact Car class ever gets rolling, and the two new V8s from Olds and Buick will no doubt run away and hide from the Lark in its present state.

Incidentally, both Valiant and Lark are also engaged in development work which will get those marques from point A to point B in less time. The former has recently announced its powerpack and much is being done to improve an already decent suspension system.

So it appears that 1961 will see a return of the horsepower race not only in the big, standard units but also in the compacts. Less and less heed is being paid the questionable AMA agreement. Instead of flagrant participation by the Detroit people there is quiet, exacting progress being made. Possibly we will never see a return to motor racing in the spirit of the early 1950s. Active factory teams with paid drivers and million-dollar budgets are, without a doubt, a thing of the past (as they should be) but, for the average enthusiast and the go-to-market motor racer there are some real surprises in store in the near future from Detroit.

PONTIAC BRASS are hoping that the motoring public will keep the sounds of Indianapolis' roaring speedsters in its ears. The basic theme of their new compact's announcement is a "song of the Speedway." The car's name is the Tempest 500; its engine is tagged the Indianapolis 500. (They are names related to speed—not unlike the tag of the successful big Pontiac Bonneville.)

The important connection between the new compact and the Brickyard lies in the Tempest's radical powerplant. It's a big-displacement, slanted-four-cylinder engine that the Pontiac people will do their best to relate to Indy's famous Offy. Except for numbering their components in the fours, resemblance between the two engines is fairly slight, although first reports indicate that the Tempest will not be adverse to some pretty high performance.

MEMBERS IN GOOD STANDING of the "Detroit Car Watchers Club" already have reserved front line seats for the Thunderbird announcement date. They've heard that the 1961 version of the big bird of the Ford family will be even more controversial than the '58 four-seater. Rumors have credited the car with everything from front-wheel drive to rumbleseats, but the best sources report that its radical flair is confined to its styling. One advance viewer told us that this 'Bird is "about the wildest looking automobile that has ever come out of Ford's styling studios." It is long and low with a definite Italian-like look. It seems to be a car that you'll either take to heart or won't like at all.

It appears that Ford will give the new styling a year to take hold. After that, the wraps will be taken off some equally radical engineering.

CHEVROLET'S XP-700 CORVETTE, presented in the July, 1960 MOTOR TREND, has rightfully been called a "car with a future"—a very near one at that. Those who are familiar with its swept-back rear lines won't be at all surprised when they view the '61 version of Chevy's sportscar.

SPEAKING OF CORVETTES, there are good, strong clues that the fuel injection option will be taken off the books this fall. Some technical bugs are popping up on two-year-old versions and the Chevy engineers figure that it is a good idea to bench the mechanism until it or a better system can be perfected.

A CERAMIC-COATED EXHAUST SYSTEM will be a big selling point on all 1961 Ramblers. Originally developed for military jet engines, the system is said to be virtually impervious to corrosion.

The ceramic is applied by dipping mufflers and tailpipes so that both outer and inner surfaces are coated. The coating is then fused to the metal in a continuous furnace at 1500° Fahrenheit.

After the ceramic process is completed, a layer of asbestos insulation and the outer cover are applied to the muffler. More than 5000 pilot mufflers were produced and tested during the three-year testing program.

AN ELECTRONIC HIGHWAY with true automatic pilots for cars was given the first full-scale test this summer in Princeton, N.J. Developed by RCA, the system successfully controlled acceleration, braking and the maintenance of safe spacing through the use of electrical signals from the road. Circuits in the road were also used to speak to the driver through his car radio.

NEW ELECTRICAL SYSTEMS are often hinted at, but it appears that such a development has a good chance of breaking through at Chrysler. The company's major electrical supplier, Auto-Lite, has been working very hard on an all-new transistor-powered unit.

"Wire wheels will be available for the 1961 Corvette and Corvair."
TRUE—At least one supplier (Dayton Products) will offer such units for the '61 Corvette and Corvair. Both will be of the center-lock, knock-off variety. No price has been forthcoming though upwards of $300 per set of five is predicted for either type.

"Ford's new small, front-drive car will first be marketed in Canada."
QUITE LIKELY—Reports from Dearborn now have it that the new small-small car that's currently being developed will first be sold under the Taunus nameplate north of the border. Expected announcement: July 1961.

"Chrysler will offer solid lifters in 1961 engines."
QUITE LIKELY—Renewed interest in performance versions of the 383- and 413-cubic-inch Chrysler engines by the factory indicate that a limited production of solid lifter engines will begin after the new models are announced.

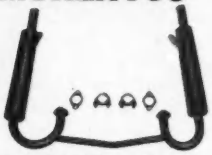
"A Valiant coupe is on the way."
POSSIBLE—Observers close to the Corporation report that the Ghia-designed coupe version of the Valiant (first shown in MT, Feb., 1960) has been under consideration by Chrysler stylists and marketing people for a possible inclusion in the 1962 Valiant model line-up.

"A small Cadillac is coming in 1962."
FALSE—Despite continued rumors to this effect, Cadillac officials vehemently deny such a report. The possibility that the Cadillac may undergo a substantial alteration in size is likely but as for a "T-Bird" version or anything remotely resembling a "compact," spokesmen insist such conjecture is totally untrue.

"A four-speed Ford transmission is planned."
QUITE POSSIBLE—Much attention has been given such a transmission by Ford engineers and sales officials. A Ford with "4-in-the-floor" may be a reality before the year 1960 is out.

Power UP
Efficiency UP
Performance UP
WITH
Douglass DS-560 Duals

Douglass CORVAIR DUALS
1st TO "Power Up" THE
CORVAIR MONZA 900



Unlock the full potential of the Corvair engine with Douglass Duals. The complete set is Easily and Quickly Installed. It includes Matched Mufflers (glass pack or steel pack) with attached Triple Plated Chrome Tips, Pre-Welded Brackets, Two Clamps, Two Gaskets, Notching Template and Easy Instructions.
COMPLETE DOUGLASS DS-560 DUAL SET $34.00
At Your Dealer Or Write Direct
DEALER INQUIRIES INVITED

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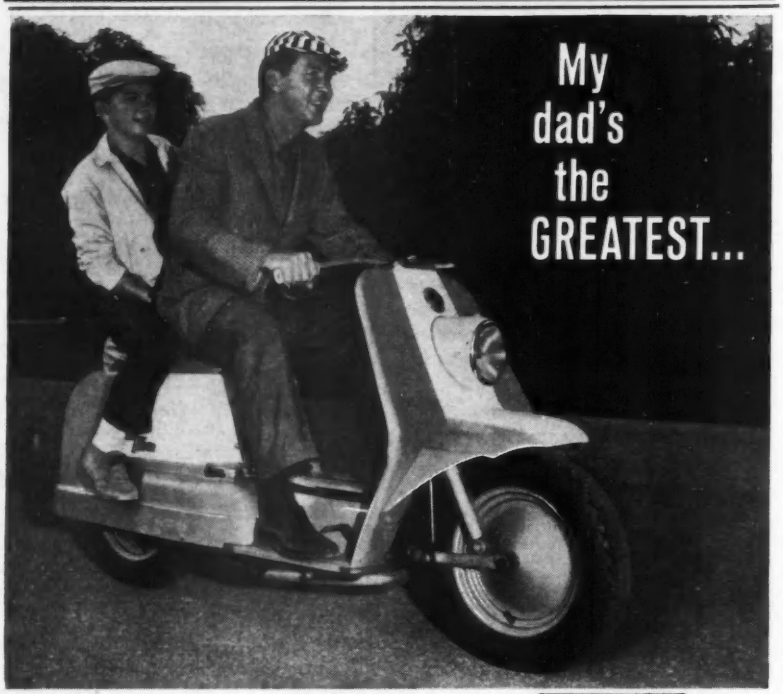

and so is my new HARLEY-DAVIDSON Topper

Like father, like son... happy with the new Topper.

What a ride — gentle as a billowy summer cloud... with dual suspension and large foam rubber saddle. Dependability — plenty of get-up-and-go. Automatic *Scoot-away* transmission—no shifting or clutching needed.

Dad is sold on safety features like the large diameter wheels and sure-stop front and rear drum brakes. Tells everyone about Topper economy — up to 100 miles to the gallon.

Mom's a Topper fan, too! She likes its good looks: sharp, clean lines molded in tough beautiful fiberglass... two-tone color styling ...chrome-plated instrument panel.

See your Harley-Davidson dealer. He will arrange a fun-filled demonstration ride. Or send in the coupon for literature.

HARLEY-DAVIDSON MOTOR CO.
Dept. MT, Milwaukee 1, Wisconsin

Send me more information on the Harley-Davidson Topper

Name.....Age.....

Address.....

.....

LATEST PARKING PLAN France has come up with the latest solution to the parking problem that now plagues all the world. For $10 a month Frenchmen can hire a workman who will jockey their car to a new space as the time expires on the parking area where the car is parked.

SMOOTHER RIDING United States Rubber Co. has developed an extremely sensitive electro-pneumatic device which measures the roundness and rolling resistance of tires—two factors which have a strong bearing on smoothness of ride. Any tire that can't come closer to being perfectly round than .047-inch causes a red light on the machine to flash, a signal that the tire has flunked.

FOR YOUR LIBRARY *The Indomitable Tin Goose*, by Charles T. Pearson is the story of Preston Tucker and his car. Twelve years ago, the name of Preston Tucker flashed briefly across the world's headlines when he was indicted by a Chicago grand jury. Ever since Tucker's death, myths and legends have grown up around the man. There are many people who point out that literally dozens of features which Tucker advocated are being incorporated into standard makes today. These are only a few of the questions the reader will ponder after he finishes this well-written, thought-provoking biography. (Abelard-Schuman, $4.95.)

My Engine Is Missing, by Homer. MOTOR TREND readers will be familiar with Homer Provence's cartoons which have appeared in this magazine. This volume is a collection of originals and reprints of Homer's funniest cartoons. (Count Publishing Co., Whittier, Calif., $2.95.)

STICKY BUSINESS A new adhesive-like material, designed as a protective coating for roof gutters, metal flashings and corrugated galvanized roofing, also can be used as an economical automobile undercoating. The new material, called Pliogrip 12-3 by its manufacturer, the Goodyear Tire & Rubber Co., forms a tough resilient coating that is highly resistant to oils, chemicals and organic acids. The aluminum-colored coating is based on synthetic rubber and can be easily applied by brush.

AUTO ACCESSORIES Dealers and wholesalers will be seeing next year's designs when the National Auto Accessory & Parts Exhibit opens on September 12 at the Las Vegas, Nev., exhibit hall.

TOP RODS AND CUSTOMS America's biggest display of hot rods and custom cars will start on September 1 at Detroit, Mich. Highlights of the National Championship Drags and National Champion Custom Car Show will be the drag races when the country's top hot rod drivers will compete for national titles and prizes. Awards this year include a Ford Sunliner, Country Sedan, Falcon station wagon and a Falcon Ranchero.

SEAT BELTS MANDATORY Safety seat belts will be standard equipment on all cars in only a few years, according to U.S. government health experts. But they admit that just installing the belts won't make people use them. This will take a long period of education. Recent government studies have proven the value of safety belts.

CARS LASTING LONGER? American motorists are keeping their cars longer than ever if reports from scrap dealers are accurate. Last year there were only 2,760,000 cars scrapped. This is the smallest amount of cars that have found their way to junk dealers in six years. In '57, 4,900,000 cars were scrapped.

ALFA ROMEO SPORTS COUPE Built from designs originated by Pinin Farina, Alfa Romeo of Milan has constructed a special sports coupe that will be exhibited in 32 cities of the United States. The car will be driven from New York to California and will arrive on the West Coast on August 28.

"GRAND THEFT AUTO" An all-too-often entry on police blotters around the nation — one important factor in rising automobile insurance rates. Between 1950 and 1958, according to FBI figures, auto thefts increased 42.6 per cent on a national average. In cities over 250,000 population, the increase was 60.9 per cent. The moral of the story seems simple: If you want to help halt skyrocketing insurance rates—whether you live in a big metropolis or a small town —discourage theft by removing ignition keys and locking car doors.

BELGIAN RACING DRIVERS They can start young, thanks to a petroleum company which tours a fleet of miniature racing cars around small towns. Short hay-bale-lined tracks are laid out in the main square, and children from nine to 13 are instructed in competition driving. Those registering fastest times (20 mph is top speed) compete in area championships.

IF YOU REALLY LOVE YOUR CAR!

DON'T FAIL TO GET THESE 2 AMAZING PRODUCTS

CAR-SKIN RECONDITIONER

If you've always thought cleaning a car was a tough job you're in for a surprise. *Car-Skin Reconditioner restores the original showroom lustre of any car with hardly any effort!* It doesn't matter how faded the paint is—how much tar, bug or bird stains, road film there is. Quickly, easily and with NO RUBBING this remarkable reconditioner restores the original glowing natural color of the finish. The reason is simple—THIS IS THE ONLY CAR CLEANER WITH A DRY CLEANING CHEMICAL THAT DOES ALL THE HARD WORK FOR YOU. There are no abrasive materials — YOU DON'T NEED ELBOW GREASE. It leaves the surface dry and oil free. And you will be really amazed how completely this cleaner cuts through the dirt and stain and gets right down to the original paint. Your car will sparkle like new—the original color will be restored. Car-Skin Reconditioner is the world's fastest, safe car cleaner—especially made for the man who cleans his own car. And it goes a long way. One 16 oz. can will completely clean and restore 2 badly oxidized cars or 3 or more normal ones. If you've tried other car cleaners only to find that you have to do all the work—try Car-Skin Reconditioner. You'll be surprised and delighted to discover how easy it is to keep your car looking factory-new. All you do is wipe it on—let dry—and wipe off. NO RUBBING NECESSARY. You'll have a brilliantly shining car in 45 minutes or less. Be sure to get a can today.

16 oz. CAN $1.45

READ THESE LETTERS!

"We find your Reconditioner the best on the market—everything you say it is." — R.B.H., DALLAS.

"Your Reconditioner is the finest product I've ever seen." —C.F., WASHINGTON, D.C.

"Your Reconditioner would be a value at twice the price." — JBE, RICHMOND, Ind.

"Truly the greatest thing on the market." — T.H.S., PORTSMOUTH, N.H.

CAR-SKIN ADVANCED FORMULA PASTE WAX

CAR OWNERS RAVE ABOUT THIS NEW WAX!

"Your Advanced Formula is everything and more than Motor Trend said it was." — H.G., RIVER EDGE, N.J.

"I have never seen anything in auto waxes do such a wonderful job." — G.M.S., LANCASTER, N.H.

"Congratulations! It's a wonderful wax. My car looks like new." — R.L.K., PITTSBURGH

Here is the first and only NO-RUBBING Paste Wax with a duration of up to 12 months. Introduced a year ago, it has proven that now your car can have a brilliant, steel-hard yet flexible protective coat that is PRACTICALLY INDESTRUCTIBLE. This Modern Scientific Achievement just didn't happen over night. Car-Skin's chemists tested literally hundreds of formulas before discovering the weather resisting elements in this Advanced Formula. What makes this wax so outstanding is not only the unique way it locks in the finish of your car in a lasting protective shield but also the absolute ease with which it is applied. You just wipe it on and wipe it off. NO RUBBING WHATSOEVER. And you can wax the entire car at one time —not just one small area at a time. It is equally good for all finishes—acrylic, lacquers, enamel. Not only does it provide a crystal clear coating that permits the full brilliance and color of your car finish to shine forth it actually adds lustre to the original finish. Car-Skin Advanced Formula resists rain-spotting, shrugs off dust and road film so that your car retains that "new" look far longer. It has been thoroughly tested —by ultra violet ray, scorching heat and sub-zero temperatures. And it goes a long way — one 5 oz. can is more than enough for 3 to 4 average cars— more for the new compacts. So be sure to try this remarkable new Scientific Achievement on your car. Order it today.

IF YOUR DEALER CANNOT SUPPLY YOU, WRITE US

TESTED AND APPROVED MOTOR TREND

BOTH NO-RUBBING PRODUCTS TESTED AND APPROVED BY MOTOR TREND MAGAZINE

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RORY CALHOUN DRIVES THE SOUTHERN 500...

Starring in the motion picture, "Thunder In Carolina," Rory Calhoun plays the part of Mitch Cooper, former Darlington winner with injuries who puts his experience behind a rookie driver. Filmed on the dirt tracks of the South, "Thunder In Carolina" builds to a dramatic, thrill-packed climax which was shot right on the Darlington track during last year's "500."

Production was a real problem. For action a regular race, the cars had to perform over and over... stopping and starting in 136 degrees heat until the camera crew was satisfied with a "take." It was a gruelling test for cars and it could have cost the production plenty if one of them had broken down. That's why the producers of "Thunder In Carolina" used Wynn's Friction Proofing products in the cars to protect them against trouble... and every car came through trouble-free.

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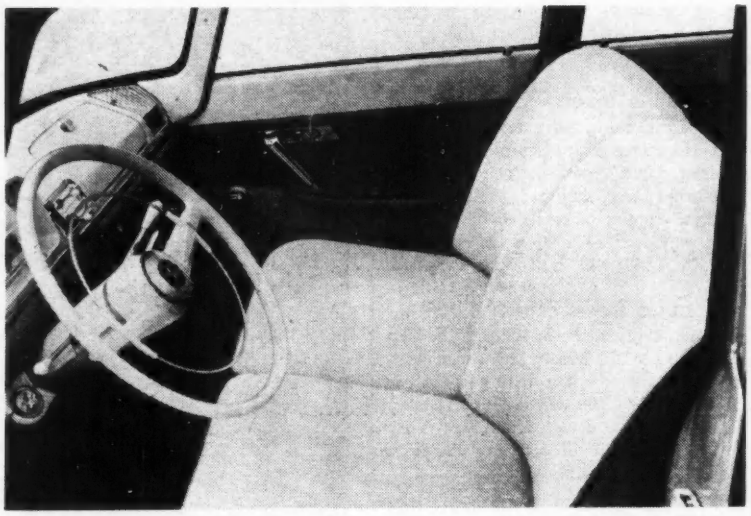
WYNN'S FRICTION PROOFING

The Proof is in the Performance!

Overseas Report

PEUGEOT 404

Peugeot 404 sedan—a synthesis of Pinin Farina styles for BMC and Lancia.



404 interior features shaped bucket seats, air vent louvers at end of dash.

Four-cylinder Peugeot will not be imported into United States until 1961.

THE LONG-HERALDED new Peugeot 404 turns out to be not a successor to the recently abandoned 1.3-liter 203 (as some people had predicted) but a new 1.6-liter four/five-seater, more powerful and slightly more expensive than the 403, which continues in production in its normal and newly introduced 1300cc economy forms.

The 404 will not reach the U.S. until sometime in 1961 and the 403 sedan will remain on the market.

The new car has a 1.6-liter oversquare engine, canted over on its side at 45 degrees. The 404 offers body space almost equal to the 403 but is smaller and lower built. Body styling, for which Pinin Farina acted as consultant, is a synthesis of the work he has already done for BMC and Lancia, and shows no points of originality.

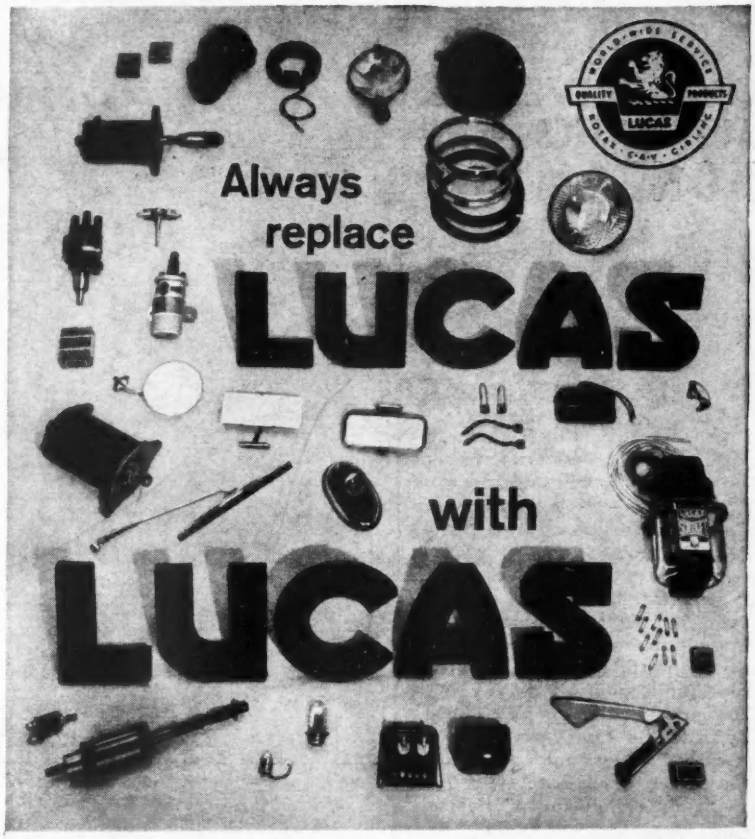
The 404 departs from previous Peugeot practice in many ways. The canted engine is said to drop the center of gravity of the power unit over two inches. The gearbox is a conventional four-speed unit, all synchronized, top being direct. With an axle ratio of 4.2 to 1, the 404 does 17.67 mph per 1000 rpm on its direct top, against 16.71 mph for the 403 which uses a geared-up top in conjunction with an axle ratio of 5.75 to 1. Transmission is by torque tube and worm final drive as on previous models, with suspension by coil springs and non-concentric telescopic shocks. Front suspension uses a long suspension strut which also acts as steering kingpin similar to the MacPherson system on the British Fords and the type used on the French Vespa. The outer casing of the shock acts as the kingpin and has the hub attached to its lower end. The upper pivot is a ball bearing in the cup at the lower end of the concentric coil spring.

The engine, following Peugeot practice, is a four-cylinder unit with cast-iron block and crankcase, and inclined valves in hemispherical combustion chambers operated by angled pushrods and opposed rockers. The valves are set at a smaller included angle than previously, in a modified combustion chamber said to promote more turbulence, and the crankcase descends further below the crankshaft center line. It is an oversquare unit with bore and stroke of 84 x 73mm (1616cc) giving 72 bhp at 5400 rpm, and 93.7 lbs./ft. of torque at 2250.

Brakes have 10-inch-diameter drums approximately two inches wide. Steering is by rack and pinion. Dimensions: wheelbase 105.3 inches; tread, front 52.95, rear 50.38; height 57.1.

—Gordon Wilkins

IN YOUR BRITISH CAR...



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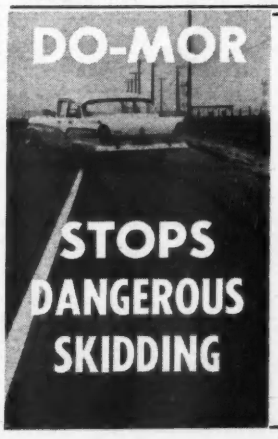

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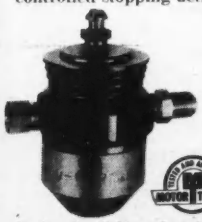

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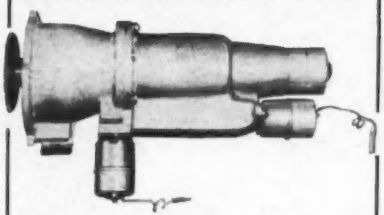

Since Detroit continues to manufacture high powered automobiles with automatic transmissions and overdrive, there is a greater than ever need for the all new HONEAMATIC. Now it's possible to have your cake and eat it too, that is to say that the horsepower developed by the late model Ford is more than enough to pull an overdrive and still retain the high ratio rear end gearing (many new Fords carry ratios of 2.69).

Because the HONEAMATIC gives exactly 30% less engine speed for any given axle speed, you automatically benefit in 30% less engine wear and nearly 30% savings in fuel.

The HONEAMATIC is operated by use of a three position column mounted electrical overdrive switch which energizes (or de-energizes) two solenoids that mount direct to the HONEAMATIC unit. You the driver have complete control over the unit at all times.

The HONEAMATIC consists of a special engineered case, precision machined input and output shafts and two solenoids. The rest of the overdrive contains stock Borg-Warner components insuring parts availability at any Ford agency.

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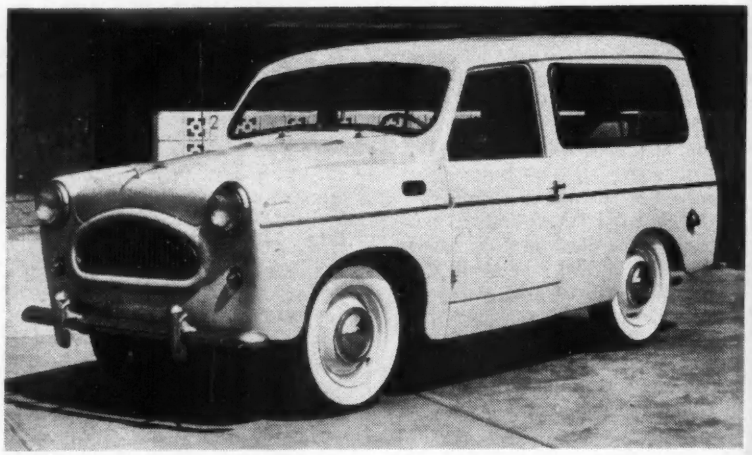
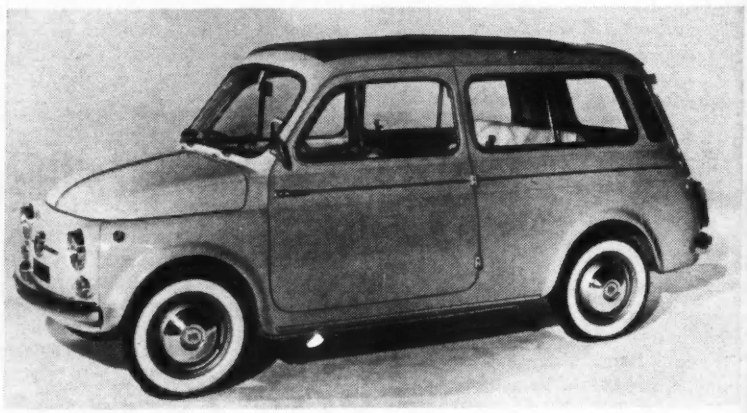
(Also see pages 79-81 in July '60 HOT ROD MAGAZINE)

Overseas Report

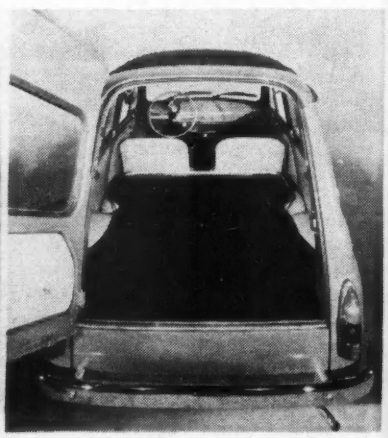
New Wagons on the Way



Sabra, first car designed and produced in Israel, recently unveiled its station wagon model in the United States. Body is fiberglass with wood framing.



Fiat 500 Giardiniera is the first modern car to have an underfloor engine. Four adults can be carried and seat folds forward for maximum cargo space.



THE SABRA, the first automobile designed and produced by an all-Israeli company, was recently introduced in this country. First models imported were the station wagon and panel truck. Later a convertible, hardtop, two- and four-door sedan and pickup truck are to be available.

The Sabra has an all-fiberglass body with hardwood framing and a steel chassis. The car is powered by a four-cylinder, 36-hp engine. The powerplant is manufactured by Ford of England. Displacement is 1172cc, bore and stroke, 2.5 x 3.64 inches, and compression ratio 7 to 1.

Other features are three-speed manual transmission, 12-volt electrical system and internal expanding hydraulic brakes. Suspension is independent coil springs on front with semi-elliptic on the rear.

Wagon specifications are: wheelbase 85 inches, length 145, width 60, height 64 and weight 1740 pounds.

Price of the station wagon model, p.o.e. Los Angeles, is $2098; panel truck, $1983; and the pickup truck, $1951.

FIAT'S 500 GIARDINIERA is a new solution to the rear-engine station wagon problem. The small car has room for four adults with luggage, or with driver alone, up to 440 pounds of cargo.

The engine is flat and canted 90 degrees. The arrangement of all its auxiliaries, from fan to the carburetor, had to be adapted to the new position. The 17.5-hp engine is a horizontal two-cylinder in-line arrangement. Air for the carburetor and cooling system is drawn in through apertures in the rear quarter panels behind the side windows.

The dimensions of the Giardiniera, except length, are practically the same as those of the 500 Sedan—length 125.3 inches, width 52.1, height 53.3, wheelbase 76.4 and cargo capacity 28.3 cubic feet. All parts of the Giardiniera which are subjected to greater stresses by the increased load capacity have been reinforced.

The Giardiniera version of the 500 was introduced in Italy during May and will be available in the U.S. about the end of this year.

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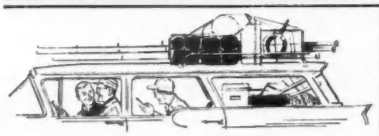

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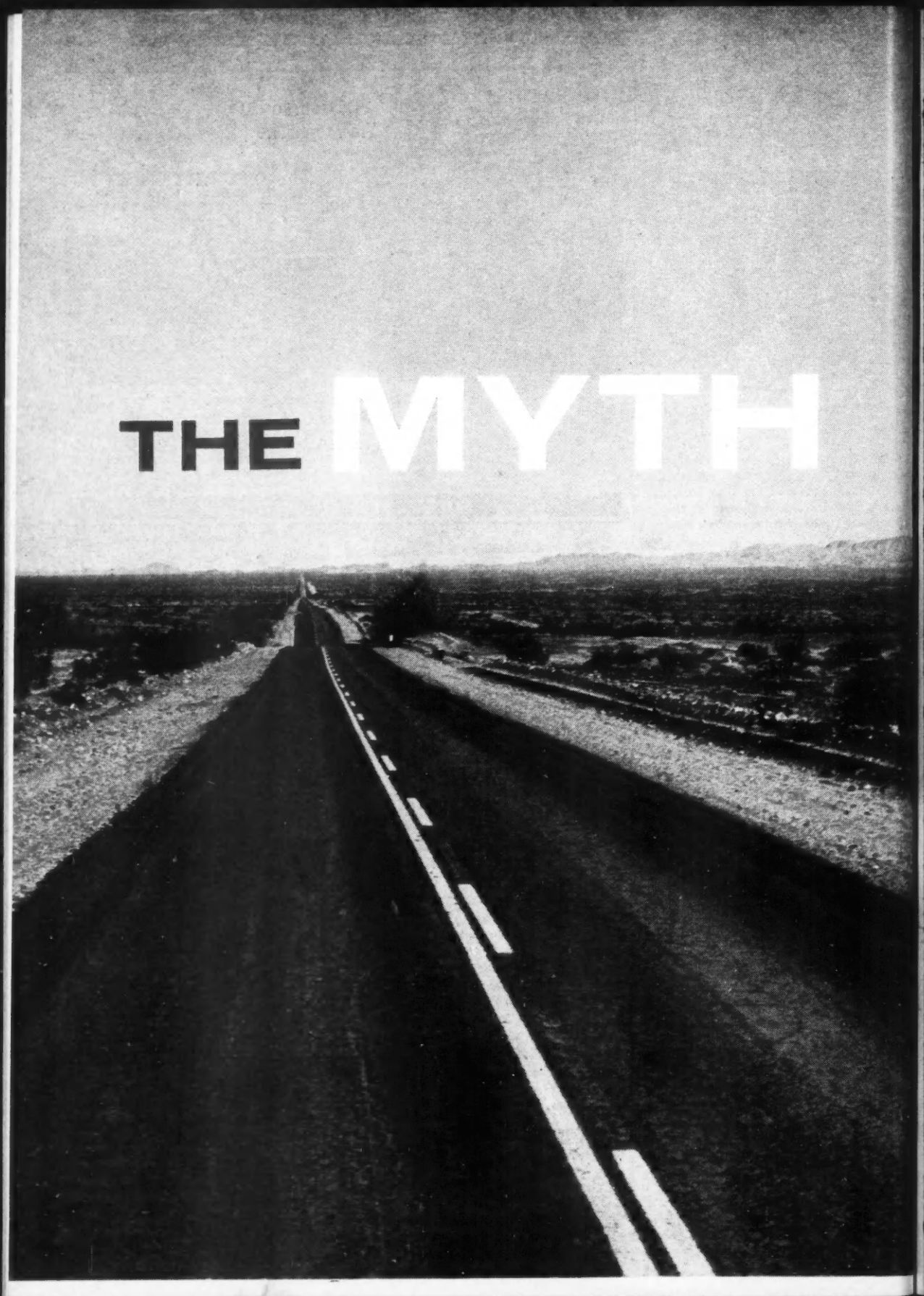
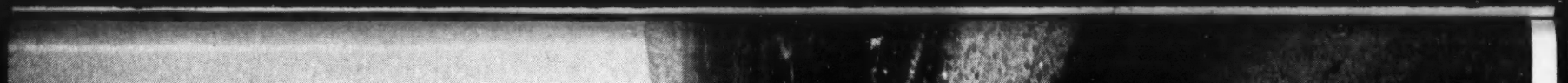

THE MYTH



Do driving habits affect fuel consumption? A special Motor Trend economy run destroys one of the old theories of the auto world.

OF GAS MILEAGE

WHEN AN AMERICAN CAR in good mechanical condition turns in a bad fuel consumption record, Detroit invariably points an accusing finger at the car owner's driving. Strangely the owner is usually complacent, accepting this decision without proof. He stands tried, convicted and sentenced by someone who has never seen him and knows nothing about his personal driving habits.

Drivers are bluntly told that they—and no one else—are responsible for their car's bad behavior. So often is this done that the story has become a myth—the myth of gasoline mileage. In condensed form it goes something like this: *Gas economy is a mighty tricky thing. Of the many variables that affect mileage the most important and least predictable is the driver himself. Even though his car is in perfect mechanical condition an average driver can lose as much as 30 per cent of his gasoline through poor personal driving habits.*

But is this true?

There is not one shred of evidence to substantiate the theory that average driving habits, good or bad, significantly affect the miles per gallon figures of any car.

For 12 years the editors of MOTOR TREND have been testing every make, model and variety of automobile that Detroit builds. During these tests it has often been necessary for many persons to drive the same car. Test drivers have been widely separated in their personal driving habits. The cars were standard Detroit automobiles without special gimmicks. All cars were given extensive road tests and the gas mileage figures were obtained with normal driving habits.

In reviewing the files of these test cars over the years one fact stands out. Not once did any driver turn in a miles-per-gallon figure substantially different from the average. In most instances any discrepancy was so slight that it was inconsequential. This has been true not only on this magazine but with research laboratories and testing companies. It has even been proved in the extensive research departments of major automotive manufacturing companies.

It is strange indeed, then, that no one has ever spoken up in defense of the average driver. But no individual could speak authoritatively simply because no one has ever set out to test a car and drivers for the single purpose of finding out exactly how much personal driving habits affect overall fuel consumption. To conduct such a test and be 100 per cent accurate would be impossible, for each driver would have to drive the same car at the same time. But there is another way, one so close to this impossible ideal that there are practically no chances for error in the end results.

Each driver must drive the same car over the same road at the same time of day. Under these circumstances there are identical traffic patterns, highway situations and, if the tests are run off in a short period of time, there are no changes in the road or the weather.

To prove or disprove the gasoline mileage myth once and for all, MOTOR TREND conducted this experiment. Every detail was carefully planned and executed to insure that each trip was exactly like the preceding one. Each driver had identical situations and the only difference in any trip was the way the individual solved these situations by his own personal driving habits.

The car selected for this test was a 1960 V8, standard-size American car in the low-priced field. The horsepower rating was around 250, the axle ratio less than 3 to 1 and the body style was a sedan. Optional equipment included automatic transmission, power steering and brakes, radio and heater. The car was well broken in and just before the road test all mechanical features were checked and tuned up.

The route was the same for all drivers. It included approximately 11 miles of freeway, 14 miles of medium traffic, 24 miles of heavy traffic, 20 miles of steep winding mountain road and the balance divided equally between fast super highways and narrow highways. All turns were logged and drivers told where to stop for lunch.

Each driver was selected after a thorough study of his personal driving habits. To be absolutely certain that no driver would deliberately or unconsciously try to change his driving pattern, no one divulged the exact nature of the trip. In most cases drivers were told that the car had a new product installed and they were to comment on how it handled. The route included all types of driving situations to get an overall picture of as many driving habits as possible.

The gasoline tank was accurately filled by the same person each time, then the car driven 9/10 of a mile and parked. Here the test driver picked up the car and after the trip returned it to the same parking lot. No explanation was given for the locked gas cap and the key was deliberately removed from the key ring.

Four men and two women took part in the experiment. Three of the men were picked because they are average drivers, and one because his habits are definitely not those which would give good mileage. One of the women was a career girl who drives to work every day, the other a housewife who seldom drives farther than the market.

The results can be seen in the tabular form on the last page of this article. The overall gas average was 15.8 mpg. The total

THE MYTH!

continued
time average, 4 hours and 54 minutes and the average speed was 38.66 mph. The measured distance of the course was 185 miles.

These figures were obtained by carefully recording the time, gas consumed and odometer readings of individual drivers. By averaging each total it is possible to determine what results a typical, normal driver should expect when driving this specific car on this specific trip.

Before discussing the mileage myth it is necessary to give an accurate definition to the term, "average driver." In examining the table of averages closely there is one obvious fact. No driver is exactly average for all the figures. Driver C who comes the closest is far off in the mph average. So there is no all-around average driver.

Therefore an individual is average for only one set of circumstances. This is easily proved by comparing the mpg column and the mph column. One of the poorest economy records was turned in by one of the slowest drivers and two above-average mpg figures were obtained by faster drivers.

Since the mileage myth refers to gasoline economy, an average driver as far as the myth is concerned can be determined only by the miles per gallon he gets. Our average driver should have gotten 15.8 mpg regardless of his personal driving habits.

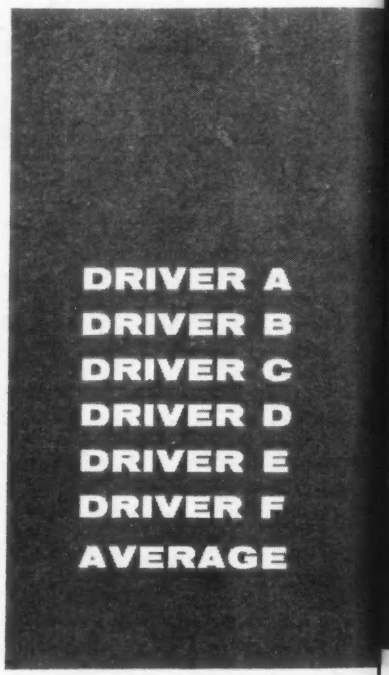
On this basis specific statements of the mileage myth can be examined and proved or disproved.

Lose as much as 30 per cent of his gasoline. Driver A, who turned in the poorest record, got only 1.6 mpg less than average. Driver F was only 1.2 mpg better than average. Neither of these differences represents anything like a 30 per cent error. Driver A was exactly 10.1 per cent poorer and Driver F, 7.6 per cent better. An error of 30 per cent would have been either 11.1 mpg or 20.5 mpg, but both these figures are out of the average driving range.

From this test, and from MOTOR TREND's 12 years of road test records, it is highly improbable that an average driver will vary less than 10 per cent from the average mpg figure for all drivers.

Least predictable is the driver. Nonsense! With upwards of six million new cars on the road each year plus billions of passenger miles, it would be ridiculous for any major automobile manufacturer not to be able to predict how an average driver will act behind the wheel. The truth of the matter is that these prognostications are made each year and with incredible reliability. They are the subjects of books, magazine articles and even college theses. In fact, every major Detroit automotive manufacturer has a huge department entirely devoted to this purpose. Driving habits are analyzed, conclusions drawn and each habit seriously influences the design of next year's new car. It is not a question of predicting how the average owner will drive—Detroit already knows that better than anyone else.

Poor personal driving habits. This fact cannot stand the light of serious, objective investigation either. Fast driving, quick acceleration and sudden stops are the most frequently quoted bad habits that contribute to excessive fuel consumption.



The first two of these are usually illegal and the last does not occur often enough to seriously affect long-time gasoline economy. All three, if consistently done—as any driving must be to be called a habit—will lead to traffic tickets, revoked licenses and more often, serious accidents.

There is another factor completely overlooked by those who regard the gasoline mileage myth as an irrefutable truth. They seem to assume that all drivers who complain about their mileage have poor driving habits in every highway or traffic situation. It just isn't so. A man who drives fast on the open highway may well have compensating good habits that will produce excellent mileage in traffic, or the reverse might be true.

Those individuals who claim that poor personal driving habits are entirely responsible for poor gasoline economy are not taking a realistic, nor an unbiased, view toward fuel consumption in today's cars. Why then, is the gasoline mileage myth stronger than ever today? The reasons are obvious.

For many years Detroit has been selling its product on the basis of power, speed and style. In past months, however, there has been greater emphasis on economy. Today the public wants cars that get more miles out of each gallon of gas.

OF GAS MILEAGE

WHAT SIX AVERAGE DRIVERS "AVERAGED"

Average Miles Per Gallon	Total Driving Time	Total Miles Driven	Average Miles Per Hour
14.2	4 hrs. 26 min.	187.3	42.24
14.9	4 57	185.8	37.53
15.9	4 32	185.1	40.83
16.0	4 29	184.4	41.13
16.9	5 20	186.8	35.03
17.0	5 12	183.2	35.23
15.8	4 hrs. 54 min.	185.4	38.66

Drivers may be average for one set of circumstances but the results of MOTOR TREND'S *test proved that no driver is average for all figures. Faster drivers occasionally turned in a better miles-per-gallon figure than those who drove slower, and due to personal driving habits no driver achieved the 185.0 miles measured distance of the course.*

Because of this, car manufacturers have a tendency to be optimistic about their product and its economy potential. It is definitely to their advantage to claim the highest mpg figure possible. Frequently these records are obtained under "closely controlled scientific runs." No one can deny that a car driven over a level highway at a constant 35 mph will get far more miles per gallon than one being driven over the same road at the legal limit. But which of these figures represents average driving?

There is still further proof that car makers are being entirely too glib about economy. Speedometers and odometers installed on new cars have shown a higher percentage of error—and almost always on the plus side. Speedometers indicate a faster rate of speed than the car is actually going and some odometers have registered as much as 14 per cent too many miles traveled. An odometer error this bad would mean that an indicated 16-mpg average is actually 13.8 mpg.

Another reason for inflated economy claims is that few people ever take the trouble to make an extensive check. It is simply too tedious and time-consuming to keep a daily record of miles driven and gas purchased for any length of time.

But with economy one of the major premises of automobile manufacturing, many persons who never before considered checking their car for average mpg are now conscientiously doing so. They are more often than not disappointed when they compare their results with the economy figures they were promised.

When these unhappy motorists begin to complain, their remarks can cause embarrassment. Detroit smugly passes the buck. The rule seems to be: Never admit any guilt and always blame the driver and his poor driving habits.

This is the myth of gasoline mileage, but the facts proved in MOTOR TREND'S test show a far different picture. The record reveals conclusively that there is no significant difference in gasoline economy directly related to an average person's driving habits. An average driver has every right to expect his car to perform for him as it would for any other average driver.

The eagerness to place the blame for a car's poor economy behavior on the driver is absolutely unjustified. No driver can get 20 mpg out of a car designed to operate on a 15-mpg average. It is the car's engineering and mechanical condition that determine the mpg figure—not anyone's personal driving habits.

With compact sedans having proven to be "popular size packages," Detroit builders are looking ahead to adding other compact vehicles. Here's one.

A BUS FOR

ONE OF THE MOST INTERESTING of the forthcoming 1961 cars unquestionably is the small Pontiac Tempest, which will be unique in many of its engineering features. There are now reports that somewhat later in the model year the standard Tempest line may be augmented by a special Pontiac vehicle of the so-called bus type.

Whether or not this Pontiac bus will ever enter production is a point that cannot be established at this stage. There is, however, a prototype under study and information from reliable sources has enabled this speculative report as to its probable shape and design.

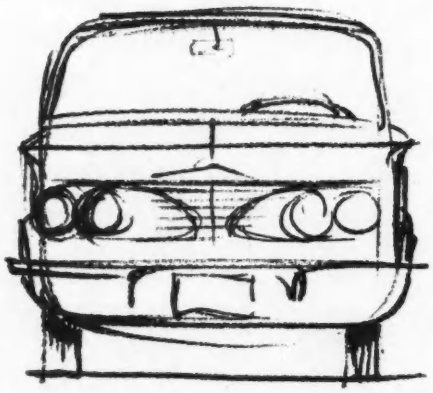
The sketches shown on these pages, incidentally, not only reveal the basic configuration of the bus, but also are highly accurate in styling of the front end which will characterize the sedan versions of the Tempest. Pontiac, in developing this undoubtedly radical engineering package, has elected to be conservative in appearance and has gone "back" to the enormously popular grille treatment of 1959. The standard Pontiac big cars, as a sidelight, will have a grille that has the same flavor, but sufficiently different to be new.

As for the compact utility bus, it, like the Tempest itself, is drawn from the same design package, the Corvair. In other words, while the Tempest sedan will use the Corvair sedan body, with numerous modifications, the Tempest bus will employ the same basic Fisher body shell as the Corvair bus. It is possible that yet another compact bus, based on these components, will emerge under the GMC label. At least it is a logical conclusion.

The Tempest bus, therefore, will have the same wheelbase as the Corvair bus and be identical from wheel to wheel as the successful Volkswagen Microbus. The wheelbase is 94.5 inches.

The chassis arrangement is less certain. Back in 1954 a General Motors dream car, L'Universelle, was shown equipped with a Pontiac engine that drove the front wheels through a Hydra-Matic transmission. Suspension was a de Dion axle. Whether or not this design has been pursued in the Tempest bus is not clear at this point.

It is possible for the Tempest bus to have either the front-wheel drive, or to employ a rear-drive arrangement with the trans-axle setup already fixed for the Tempest sedans. Some Detroit observers are convinced that Pontiac will go front-drive, if for no other reason than to beat the Ford Motor Co. to the punch.

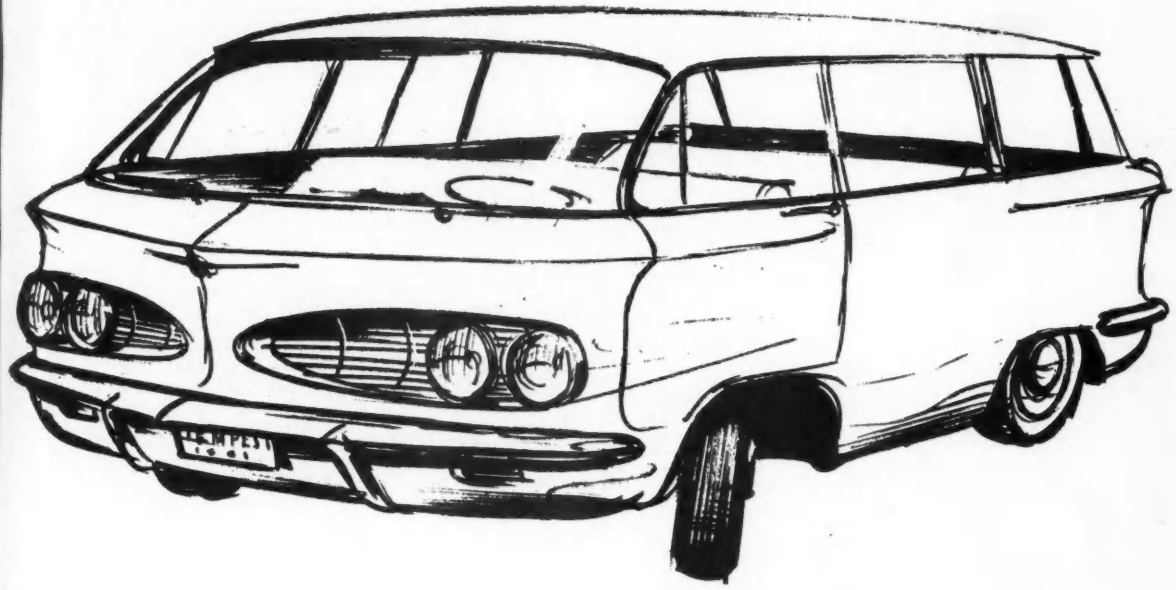


As a source of power, Pontiac has another set of options at its disposal. The sedans will have as a standard engine the new four-cylinder engine based upon half of the current Pontiac V8 layout. This undoubtedly would be ideal for the bus.

On the other hand, Pontiac also has ready for 1961 its own version of the new small General Motors V8, which could be made the standard, or an option. Odds are that the four-cylinder will be the only choice when and if this bus ever reaches dealers' showrooms.

The Pontiac Division of General Motors has been particularly vigorous in recent years and especially alert to the demands of car buyers and users. While this bus design still is in a preliminary stage, the chances of its becoming a reality are good. Bus units for either utility or commercial uses are far more functional than, say, station wagons or panel trucks. More and more people are becoming aware of this and General Motors' Chevrolet and Pontiac apparently are setting the pace for all of Detroit in producing domestic versions of the type pioneered in the United States by Volkswagen and DKW.

And it is only a step, incidentally, from the making of compact buses to providing various conversions for camping and other specialized purposes. Europe has had a head start in all of these, but Detroit now is making up for lost time.

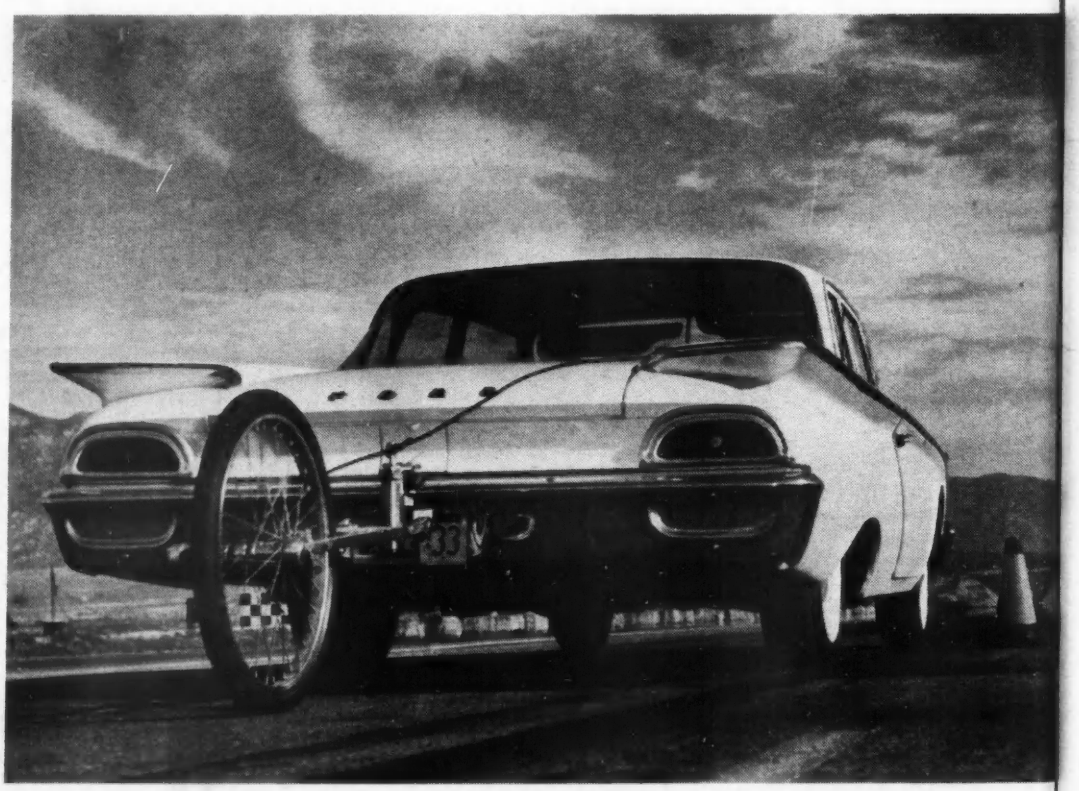


PONTIAC

ILLUSTRATIONS BY BOB CUMBERFORD

Probable shape of the Pontiac bus in the Tempest line, a late 1961 model that may be introduced about January, is shown in the above sketches. The styling of the front end is very close to what will appear on the Pontiac small cars, due this fall. The bus design is closely related to a parallel development by Chevrolet for Corvair and is patterned after the popular and practical VW and DKW utility buses.

THE 60's COME BACK



HAPPY MEDIUM BETWEEN 4 BANGER AND HEAVY V-8 PROVIDES SMOOTHNESS, ADEQUATE POWER AND FUEL ECONOMY

by Bill Taylor

SPURRED ON by the rising popularity of compact cars, six-cylinder engines, almost given up for dead three short years ago, are making a strong comeback. In 1957, at the height of the horsepower race, the Six accounted for only 17½ per cent of new car sales. The percentage crept up to nearly 24 in 1958, due largely to rising gasoline costs and the economic recession. Official returns for 1959 showed that six-cylinder preference increased to 28 per cent, but the addition of three economy cars and the introduction of a new six-cylinder engine for Dodge and Plymouth sent the 1960 sales figures to 38 per cent to date.

The revival of interest in the Six is neither an accident nor a whim. An increasing number of motorists have come to the conclusion they don't need 300 hp and 100-octane fuel to cruise at legal speeds on the turnpikes. While they still enjoy the firm push in the back that a big V8 can give, they've found it an expensive thrill.

When American manufacturers designed engines for the new economy cars, they started with clean sheets of paper. They were free to choose the number of cylinders and type of powerplant that would do the most efficient job for a car in the 2500-pound class. Disregarding such unlikely candidates as the twin and the V-12, the choice narrowed to the V8, the Six or the Four.

From an engineering standpoint, a scaled-down V8 has some strong selling points. Its compact cylinder block makes possible a short hood and maximum passenger space. The block and crankshaft are exceptionally rigid, permitting the high compression ratios which squeeze the last possible ounce of power out of every drop of fuel. The efficient dual-intake manifold with branches of equal length encourages uniform fuel distribution for highest gasoline mileage. Finally, the investment of millions of dollars and innumerable man-hours for design and production has given American car makers unparalleled experience with this type of powerplant.

The four-cylinder engine favored by British and European manufacturers has the tempting advantage of

simplicity. Using fewer parts than either of its rivals, it's cheap to build and easy to service. Because it's usually of modest piston displacement, it can be crammed into a small engine compartment.

The Six is a happy compromise between the smooth and sophisticated V8 and the strictly functional Four. It's doubtful if the newly-designed compact car engines would have any significant advantage in fuel economy over a V8 designed specifically for maximum miles per gallon. First cost and maintenance charges mean as much as gasoline mileage to the owner of a compact car, however, and it's here that the Six scores heavily. Production costs in the automotive industry are heavily guarded secrets, but when nearly 40 major parts, including a cylinder head, an exhaust manifold and a pair of connecting rods and pistons can be eliminated, it's obvious that substantial savings can be realized. If small items such as gaskets, seals, retainers, nuts and bolts are included, the six-cylinder engine can get by with at least 100 fewer parts than a V8. In addition, the cylinder block, intake manifold, carburetor, distributor and other parts of a Six are simpler and cheaper to make than comparable V8 components.

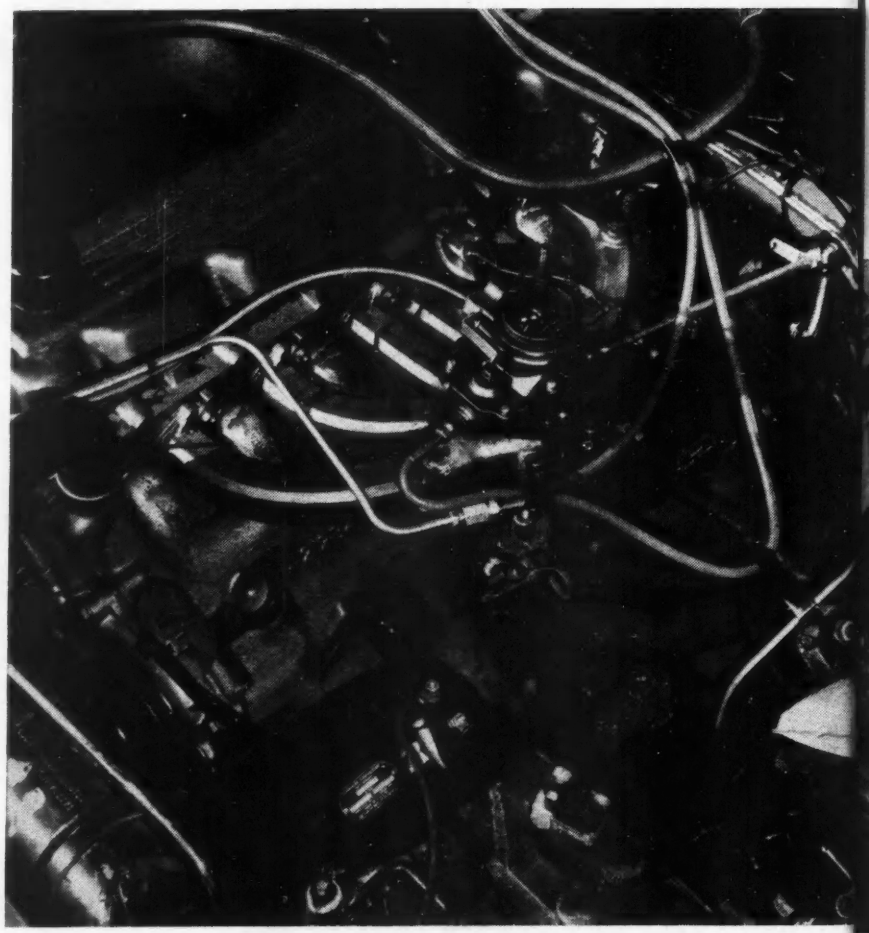
The simpler construction and greater accessibility of a Six also save the owner money on maintenance. The flat rate for a major tune-up on one of the new economy cars is 2.9 hours. At the typical rate of $5.50 per hour, the charge for this operation is $15.95. A V8 made by the same company requires 3.6 hours for a major tune-up; at the same labor rate, the car owner must shell out $19.80.

This same economy of construction and maintenance applies even more to the four-cylinder powerplant. Why, then, didn't American manufacturers pick this type of engine for their new compact cars? Simply because they were convinced that they couldn't build a four-cylinder engine of the size required for adequate performance that would be smooth enough to suit the pampered tastes of American drivers. Even British and European manufacturers usually limit Fours to a maximum piston displacement of two liters, or about 122 cubic inches. The smallest of the new compact Sixes, Chevrolet's Corvair, displaces 140 cubic inches.

The four-cylinder engine has an inherent unbalanced force that can't be eliminated by counterweighting the crankshaft. It's caused by the fact that the angularity of the connecting rod forces each piston to travel farther and faster during the first 90 degrees of crankshaft rotation than it does during the second 90 degrees. On the

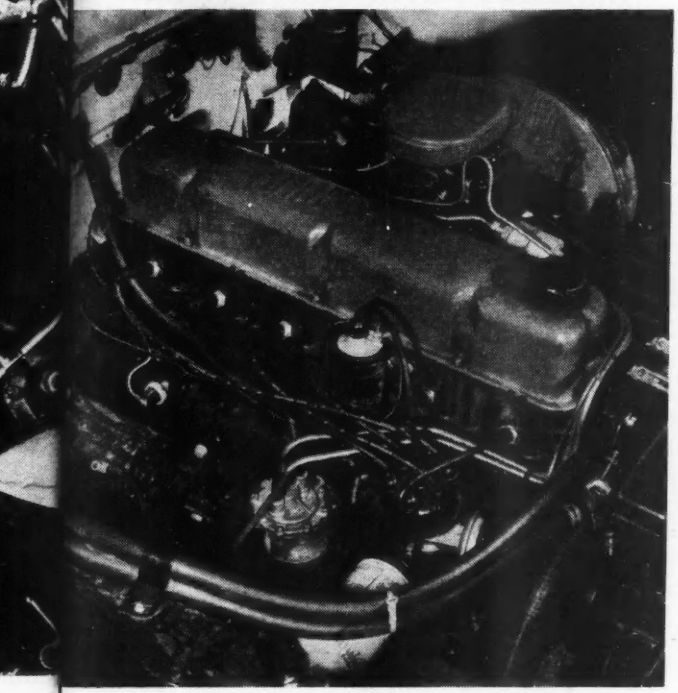
6's

continued



Chrysler Corp. 6-cylinder engine as used in Plymouth is a "stroker" version of the Valiant powerplant. This is not a modification of an old engine but a new design that incorporates thinner, lighter castings, "slanted" mounting, 6-port intake manifold, and full-flow exhaust headers that help engine breathing.

Chevrolet has been building six-cylinder pushrod engines for many years, and their reliability is undisputed. Hydraulic lifters have eliminated the familiar "tappet" clatter that has identified early Chevrolets.



Ford 6 is slightly "oversquare" with bore larger than stroke, allowing higher revs, but at no sacrifice of economy. More space in engine compartment eases maintenance, reduces costs of repair, provides space for generous carburetor air filter.

upward stroke, piston travel is slower during the first 90 degrees of crankpin movement.

The two end pistons, 1 and 4, are at top dead center while the center pistons, 2 and 3, are at bottom dead center. As the crankshaft rotates through its first quarter-turn, the faster-moving end pistons develop a greater inertia force than the two in the center. During the second 90 degrees, the center pistons reach a higher speed and develop more inertia. The result is a fluctuating vertical shaking force.

The vibration caused by this condition isn't serious in a small engine and can be absorbed by flexible engine mounts. As the weight of reciprocating parts and the engine's stroke increase, however, roughness becomes objectionable.

The highly variable torque of a Four also detracts from its smoothness. In contrast to engines with six or more cylinders, there's no overlapping of power strokes. One piston finishes its work before the next starts. The inertia of reciprocating parts doesn't help matters either. Two pistons reach bottom dead center at the same time the other pair comes to rest at top dead center. Consequently, all four must be accelerated from a complete stop twice each revolution.

The Six, with three pairs of cranks 120 degrees apart, is in natural balance and has no shaking forces to set up troublesome vibration. Counterweights balance the centrifugal force set up by each piston and connecting rod assembly as it tries to bend the crankshaft. Due to the overlapping power impulses, torque is more nearly uniform than that developed by a Four. There's less inertia to overcome because only one pair of pistons is at dead center at one time.

A big Four is likely to be a "thumper." At low speeds, the driver can almost feel individual cylinders fire as the car is propelled by a series of hammer-like explosions. Weaker power impulses, occurring with 50 per cent greater frequency, give the Six a smooth, steady power flow.

The Six's smaller cylinders also contribute to durability. With a normal stroke/bore ratio, a six-cylinder powerplant naturally has a shorter stroke than a four-cylinder engine of comparable displacement. A shorter stroke means lower piston speed, less piston travel per mile and longer life for cylinder bores, pistons, rings and bearings.

Fuel distribution is probably the Six's weakest point, but it's a disadvantage that's more theoretical than actual. In the conventional in-line Six with single carburetor, all cylinders draw their fuel-air mixture from one manifold. Because the carburetor is closer to the center cylinders than to those on the ends, distribution of fuel and air varies in both quantity and quality. Some cylinders receive a heavier or richer charge than others. Poor distribution can even cause the engine to knock. If the fuel charge in the manifold doesn't maintain sufficient velocity, anti-knock compounds and other heavy portions of the gasoline may drop out of the stream and collect in puddles. They finally flow to the most convenient cylinder, leaving the remaining barrels with a weak, low-octane mixture.

Because of the Six's overlapping strokes, two cylinders feed simultaneously from the intake manifold during most of the cycle. Consequently, neither cylinder receives its full charge.

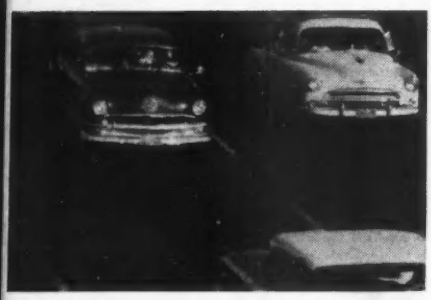
A single manifold supplies only four cylinders of a V8 or a Four. If the intake valve opened right at top dead center and closed at bottom dead center, each cylinder would have the intake manifold all to itself. In modern high-speed engines, however, the valve opens before the piston hits top dead center and closes considerably after it reaches the end of its downward stroke. As a

result, there's some overlapping of intake strokes of a V8 or Four, but to a lesser extent than in the six-cylinder powerplant.

These disadvantages are minimized in the new compact-car Sixes because they're designed for economy rather than maximum power. The mixture maintains high velocity due to the relatively small cross-section of the intake manifold, preventing heavier portions of fuel from falling out of the stream and puddling on the manifold floor. Intake valve opening is of short duration, cutting down the time during which two different cylinders are fighting for the same batch of gasoline and air.

The Six has another shortcoming that's more important to the engineering student than to the car owner. Because of the long cylinder block and crankshaft, it's difficult to obtain the extreme rigidity required for the highest compression ratios. Car makers are taking a second look at high compression, however. All of the new compact-car engines, as well as the economy engines furnished for several makes of regular-sized cars, are designed to operate on regular-grade fuel. By lowering compression ratios, designers have made slight sacrifices in miles per hour but have increased miles per dollar by eliminating the requirement for premium or super-premium gasoline.

The resurgence of the Six reflects the automobile industry's desire to supply something for everybody. The car owner who must have hot performance can still get it with V8s up to 400 hp. For the buyer who likes the handiness of a smaller car but doesn't want to sacrifice liveliness, small-displacement V8s are offered by Rambler and Lark and will probably be available on other compacts scheduled to reach the market later this year. But to more and more drivers, the low first cost, economical service and smooth, if unexciting, performance of the modern six-cylinder engine is an ideal combination for daily family transportation. Fitting neatly between tiny foreign Fours and muscular American V8s, the Six is enjoying a reincarnation on the automotive scene.



FORD

JUST HOW MUCH HORSEPOWER does the average driver really need, and how much is he willing to pay for it? Not too long ago just about every motorist insisted on a big ohv V8 as an absolute necessity to transport just himself several miles a day to and from his place of business, with weekends reserved for family trips. Then the rising cost of everything, including the premium fuel his big engine was consuming, began to burn a bigger hole in the weekly paycheck, and our high-horsepower fan joined the ranks of nearly 38 per cent of the new-car owners who purchased automobiles powered by six-cylinder engines.

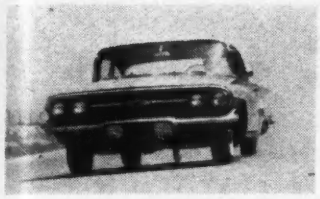
Ford started it all by shaking the domestic automotive manufacturers away from sixes when he introduced the flathead V8 in the early '30s. Now, in addition to a real thrifty six-cylinder compact car, Ford has a "big Six" that will give some of the so-called economy cars a run for their money.

A far cry from the Model T and A four-cylinder thumpers and the large-displacement V8s, the modern Six is a happy-medium engine that provides the smoothness Americans insist on, the power they demand, and the economy most of us find necessary.

As an added attraction toward stretching more miles per gallon, the MOTOR TREND test car had an overdrive unit attached to the standard three-speed manual transmission. A 3.89 to 1 rear-axle ratio, supplied with this extra-cost option, had little effect on gas mileage when in conventional driving range. The mileages shown below were all calculated in this range. Using the overdrive, which provides an overdrive ratio of 0.72 to 1 and automatic up and down shift, we recorded much the same mpg under in-town traffic conditions. However, as this unit cuts in at speeds as low as 28 mph, freeway and highway driving cut fuel consumption way down. Overall increase under these conditions averaged a solid 20 per cent more miles per gallon of regular-grade fuel. We were not striving for "economy run" performance, but we approached some of the "run" figures with ordinary driving tactics.

Don't overlook the Ford Six for big-car roominess and economy-car gas mileage. **C.N./MT**

Displacement and hp: 223 cu. ins., 145 hp
Compression ratio: 8.4:1
Performance: 0-60 18.8 secs.
Standing start ¼-mile: 21.6 secs., 65 mph
Gas mileage: City 19.7 mpg, Highway 23.8 mpg



CHEVROLET

OVERSHADOWED by the fantastic performance of the hot V8 engines, and a general trend of the public to sacrifice fuel economy for acceleration, is one of the smoothest, most economical and reliable engines available—the Chevrolet ohv six-cylinder. Mounted in a standard-sized chassis and body, the Chevy Six offers a great deal more than basic transportation.

A lighter engine improves front-to-rear weight distribution and reduces steering and braking loads on the front wheels so they can perform their functions without herculean efforts of the driver or the need for power assists. Manual shifting, or necessity for much of it, has been reduced by the high torque of the Chevy Six. Lugging down in high and then pulling out with full throttle from 10 to 15 mph is smooth and easy, with no bucking or pinging on regular grades of fuel.

The body panels and general styling configuration on a stick-shift Chevy Six are the same as on the loaded deluxe V8 models. Interior room is identical, as is luggage space. If the motorist is after a smooth, comfortable, roomy car with detailing equivalent to that of the deluxe models of about 1946, he can enjoy 1960 engineering and styling with an economy powerplant that will furnish all the speed and power to break as many traffic laws as the 400-hp-plus, premium-fuel-consuming, wheel-spinning V8s.

The MOTOR TREND test of the Chevy Six duplicated as closely as possible the conditions which the ordinary buyer would encounter. With 34 miles on the odometer, put there by driving the car from Van Nuys, Calif. assembly plant to the dealer, who gave it standard new-car service and test-drive tuning, the MT staff began mileage buildup to the regular 1000-mile service. After this, a variety of drivers began running errands, driving on the freeway during both heavy rush-hour and light traffic, and taking regular 200-mile round-trip highway junkets. Poorest mileage logged was 19 mpg flat, for peak rush-hour driving. Best for 200 miles at 50-mph average speed was 24.6 mpg. No attempt was made to duplicate an economy run.

Take a good look at this Six before you ask, "Why don't they . . .?" **C.N./MT**

Displacement and hp: 235.5 cu. ins., 135 hp
Compression ratio: 8.25:1
Performance: 0-60 18.6 secs.
Standing start ¼-mile: 20.4 secs., 63 mph
Gas mileage: City 19.1 mpg, Highway 23.3 mpg

PLYMOUTH

WE WERE PRETTY EXCITED with the performance and handling of the 1960 SonoRamic-powered Plymouth, despite its rather poor fuel economy (March MT). Later we "discovered" a new Plymouth—the Six.

Taking advantage of the expenditure necessary to design a new small six-cylinder engine for their Valiant, Chrysler Corp. engineers incorporated a lot of versatility into this all-new powerplant. Tilted to accommodate lower hood lines and still provide adequate space for a six-port intake, the basic block and bore are the same for both the compact and the Plymouth Six. By maintaining a 3.40-inch bore and increasing the stroke one inch to 4.125, piston displacement is raised to 225 cubic inches, providing plenty of torque and horsepower to haul the standard Plymouth around at a respectable but economical rate.

This six-port intake is a solution to one of the undesirable features of an in-line Six — poor fuel mixture distribution. While each intake tube from the single carburetor is not exactly the same length as the others, it is supplying the individual cylinder with enough velocity to eliminate puddling or starving. This design lends itself very well to dual-carburetion modification, as evidenced by the fantastic performance of the Valiants at Daytona earlier this year.

With stick-shift three-speed transmission and without power assists, which would be superfluous on this well-balanced combination, the Plymouth Six has even better handling qualities than its heavier V8 version. A great saving—and one that could also save your life—are the brakes. Driving the Riverside Raceways test course at speed is hard on brakes, and having tested the V8-powered Plymouth under identical conditions, we found that there were more hard stops per lap and better front-to-rear braking effort with the Six than with the heavier-engined model.

Several passengers were surprised to learn that the quiet, smooth, standard-sized car they were riding in was powered by a six-cylinder engine. Lugging out from low speeds in high gear or cruising with normal highway traffic does not strain the engine or driver—and all this with good mileage, and on regular gas. **C.N./MT**

Displacement and hp: 225 cu. ins., 145 hp
Compression ratio: 8.5:1
Performance: 0-60 17.2 secs.
Standing start ¼-mile: 20.7 secs., 66 mph
Gas mileage: City 18.9 mpg, Highway 22.2 mpg

MONZA SUPER COUPE MONZA

Does this styling prototype for Corvair's Monza coupe forecast features that may appear on '61 models . . . ?

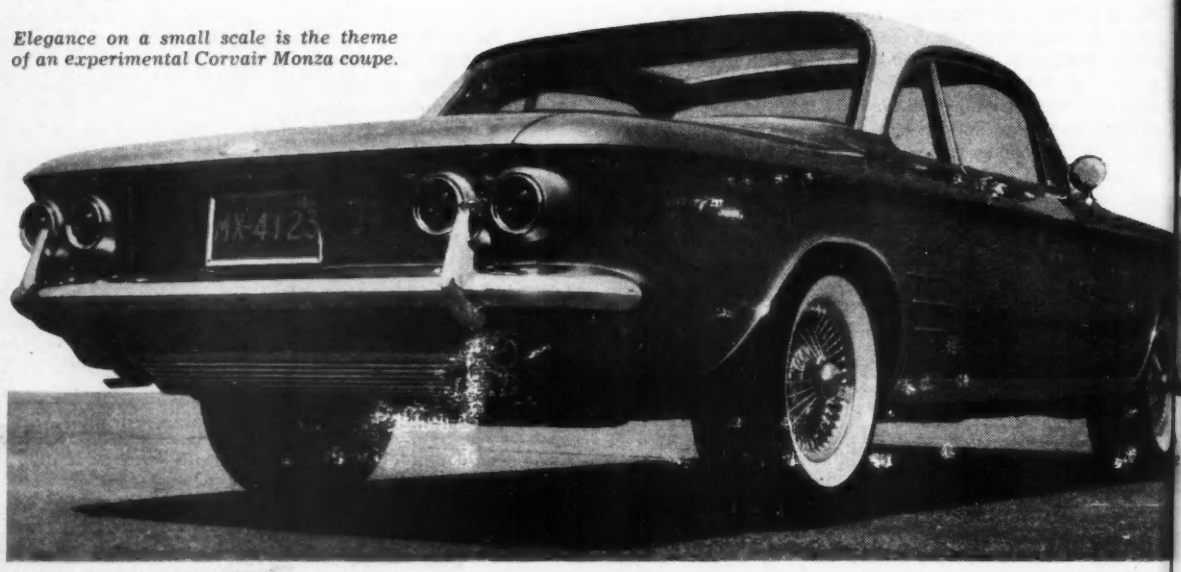
A NEW DIRECTION IN LUXURY is predicted by the latest dream car from General Motors. And, with it, some strong hints about the styling of next year's Corvair may have been revealed as well.

A sleek coupe developed from the new Monza 900, it features a much greater degree of elegance than any Corvair so far offered to the public. Many of its innovations could be used to distinguish the '61 model from the '60 or future deluxe versions from standard.

The car is a pearlescent blue with a white, grained top. The latter required a special finishing process. A thick synthetic paint was sprayed and baked in such a way that it provided a leather-like texture. Blue vinyl, matching the body color, was combined with a mohair-nylon-dacron fabric for an extremely plush interior.

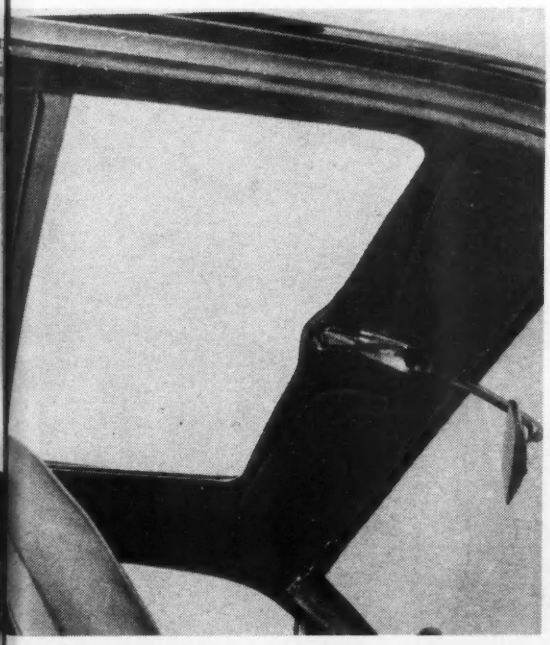
Among the changes in trim are new chrome strips across the front, airscoops ahead of the rear wheel wells, modified exhaust outlets and 13-inch wire wheels. Another novelty is a sunroof but this is *not* expected to be available as a '61 Corvair option.

The car as a whole is nothing but a styling experiment mechanically and structurally, it is completely stock. Still, it is full of details that may influence the next production Corvair and, in time, a few other General Motors cars as well.



Elegance on a small scale is the theme of an experimental Corvair Monza coupe.

The restyled front end has new chrome strips between the headlights and a special bumper guard.



European-style sliding roof, similar to that offered the '60 Thunderbird, is operated by a crank between sun visors. When closed, it provides an extremely tight seal against the weather. This is one detail of the experimental car that is not likely to appear as a regular Corvair option, apparently because of its cost.

continued

MONZA

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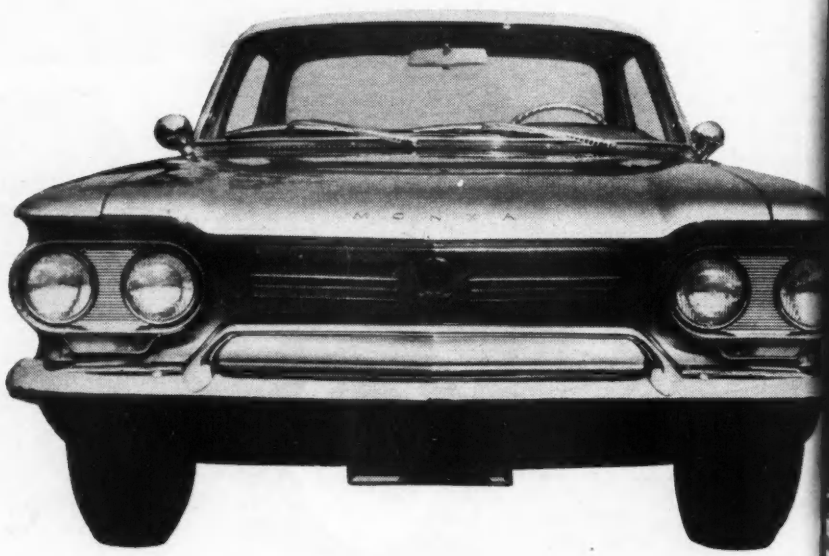
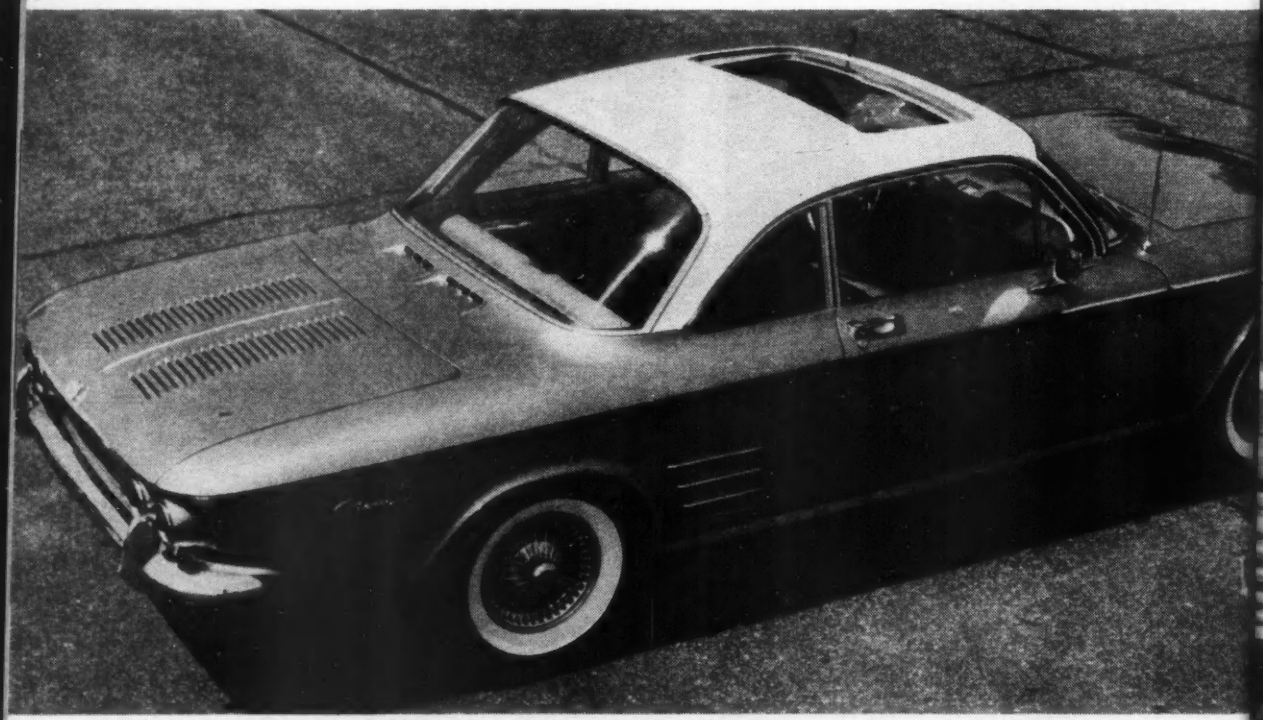
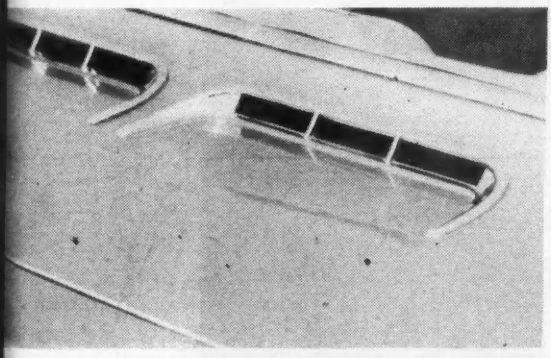
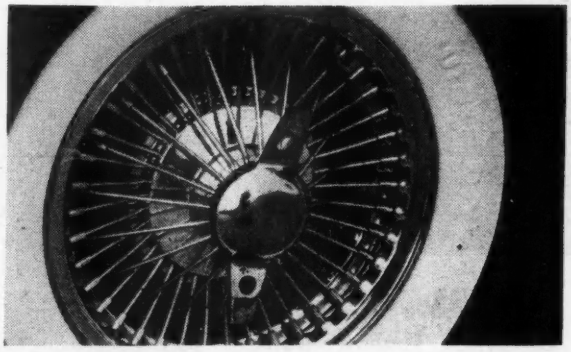


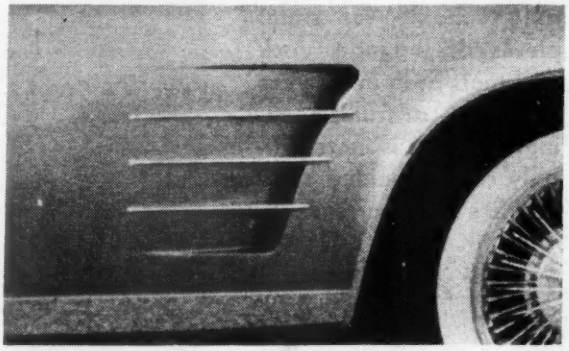


The two-tone finish of the experimental Monza is more than just a paint job. A special grained finish was achieved on the top with a thick synthetic paint that can be sprayed and baked to resemble fine leather. The body color is also unusual, a pearlescent blue.

Extreme luxury keynotes the interior finish. The upholstery fabric, a blend of durable synthetics and soft mohair, is deeply tufted for an expensive look. Both the seats and door panels are edged in a vinyl material that is colored to match the blue body paint.



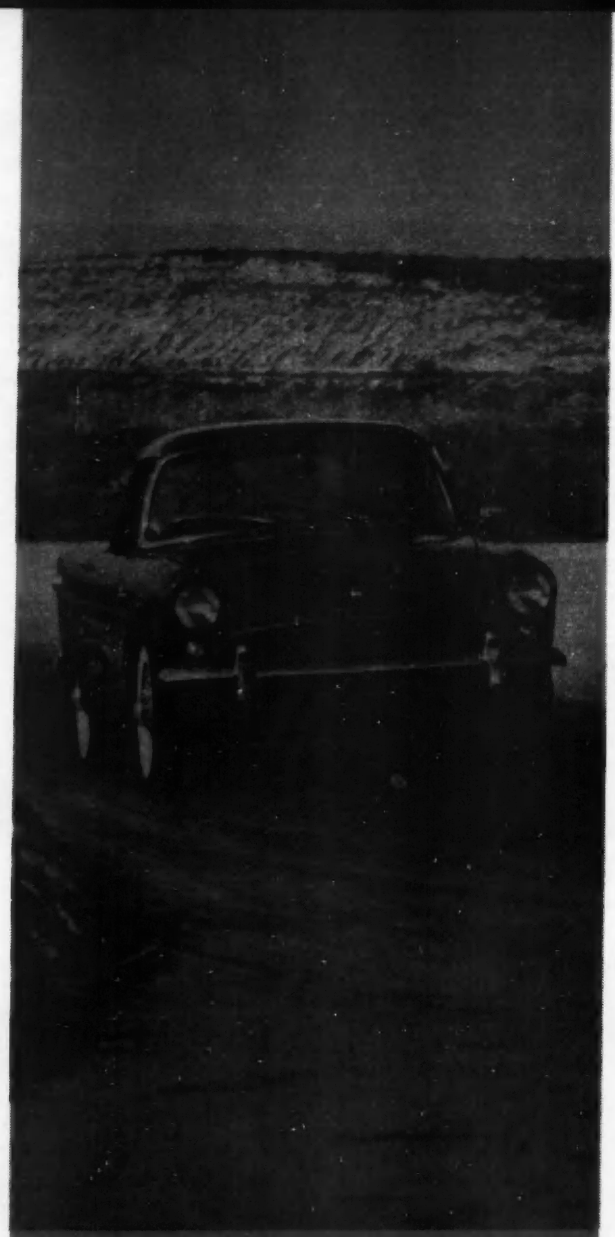




me possible trim details for future production models e the simulated scoops below the rear window, already the Monza; special 13-inch wire wheels, rumored as a '61 option; dual pipes at both exhaust outlets, notably on high-performance versions; and more simulated scoops, similar to the Renault's, ahead of the rear wheel wells.

Bright new ray in the Sunbeam line offers pleasing combination of styling, size and price in a "personal sportscar"

Shelf above spare tire comprises shallow trunk area suitable for small pieces of luggage. Jack and tools drop into recess below tire at trunk opening. Luggage is more suitably carried behind seats on kid's seat/parcel shelf.



PERSONALITY PLUS

The Alpine

ANYONE WHO CLAIMS that automobiles don't have personalities is crazy! They're man-made and purely mechanical, it's true; but each make and model has its own little quirks. Some are docile and milksop mild; others ill-tempered and ornery. The many desirable traits which we have come to seek in evaluating a car are somewhere in between this range—and the Sunbeam Alpine has its share.

Make no mistake, this is a fine automobile. While it hasn't been designed for racing, recent successes in SCCA competition along the Eastern seaboard seem to show that the whiskered saw about driving it to the market during the week and racing on weekends may not be too far off. After all, a straight-eight Sunbeam took fifth place in the 1921 Indianapolis 500. Actually, the Alpine has been designed for everything but racing—city traffic, freeway congestion, high-speed touring—you name it and it will do the job in its low-budget, gracious-living-on-wheels fashion.

The Alpine is not in a class by itself; because of its size (86-inch wheelbase, 155 inches overall) and performance, it competes for sales quite directly with the MG-A and TR-3, among others. In order to encroach upon the domains of this popular pair there must be some plus items. One plus is styling. Ever since the car was introduced last year in England observers have been singing its design praises. A sort of cleanly scaled-down two-seat Thunderbird, it appeals to nearly everyone. The car has two powerful sales arguments heretofore unavailable in a convertible sportscar in this price range ($2645, West Coast p.o.e.)—roll up windows. No matter how unsporting it may be to want good weather protection, Americans demand it. Side curtains have sold in spite of their unsatisfactory characteristics.

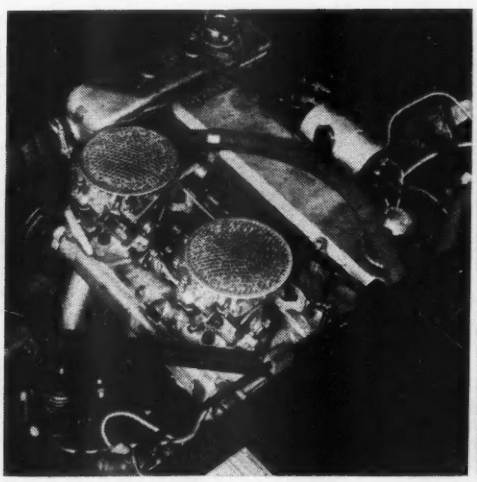
The soft top is standard equipment with the steel hard top a $260 option. While the hard top, which attaches with two toggle bolts and four quick-release clamps, offers full coupe comfort, it also restricts headroom for anyone over 5 feet 10 inches tall. There is a solution; it entails dropping the seat another inch or more—something the factory should consider. Seating on individual foam rubber cushions is quite flat, close to the floor, and does not offer much support under the knees. Again, if the seat were lowered some of this would be cured. The soft top does provide ample headroom and is completely concealed when folded in its protected compartment so that the kiddy seat-parcel area is usable. This is a space that measures 38½ by 16 inches.

Engine and suspension, indeed all the mechanical parts, are based on those of the well-proven Sunbeam Rapier. Power has been raised to 83.5 bhp at 5300 rpm, primarily through a new aluminum head with 9.2 to 1 compression. Valves are in-line and inclined and there are four intake and four exhaust ports in the 1494cc (91.2-cubic-inch) four

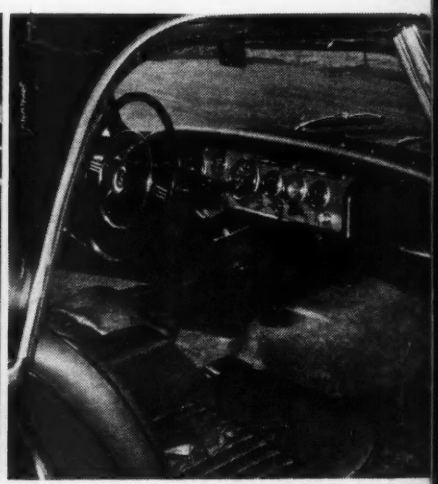
continued on page 72

by Wayne Thoms

Replacing or removing steel hard top is a two-man job which requires wrench for two bolts. Four other fasteners are quick-release type. Soft top is concealed in its own compartment when folded, offers protection when up.



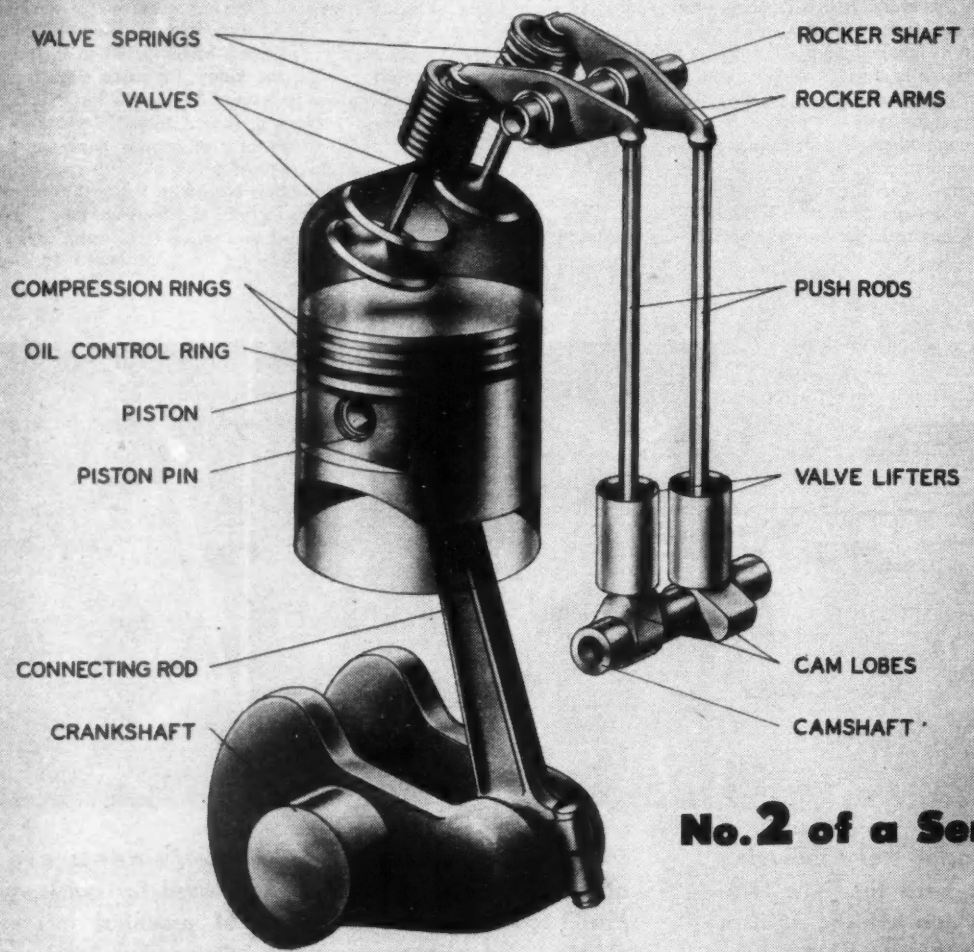
Engine components are amazingly accessible compared to most sports machines. Mill, developing 83.5 hp, is basically a hopped-up version of Sunbeam's reliable Rapier engine. Exhaust system is free-flowing four-pipe.



Instruments are well placed for quick visibility of essential information. Open glove box is supplemented by center armrest that has hinged lid and may be locked. Seating is low; foam cushions do not give enough knee support.

KNOW YOUR CAR

The Parts That Develop the Push

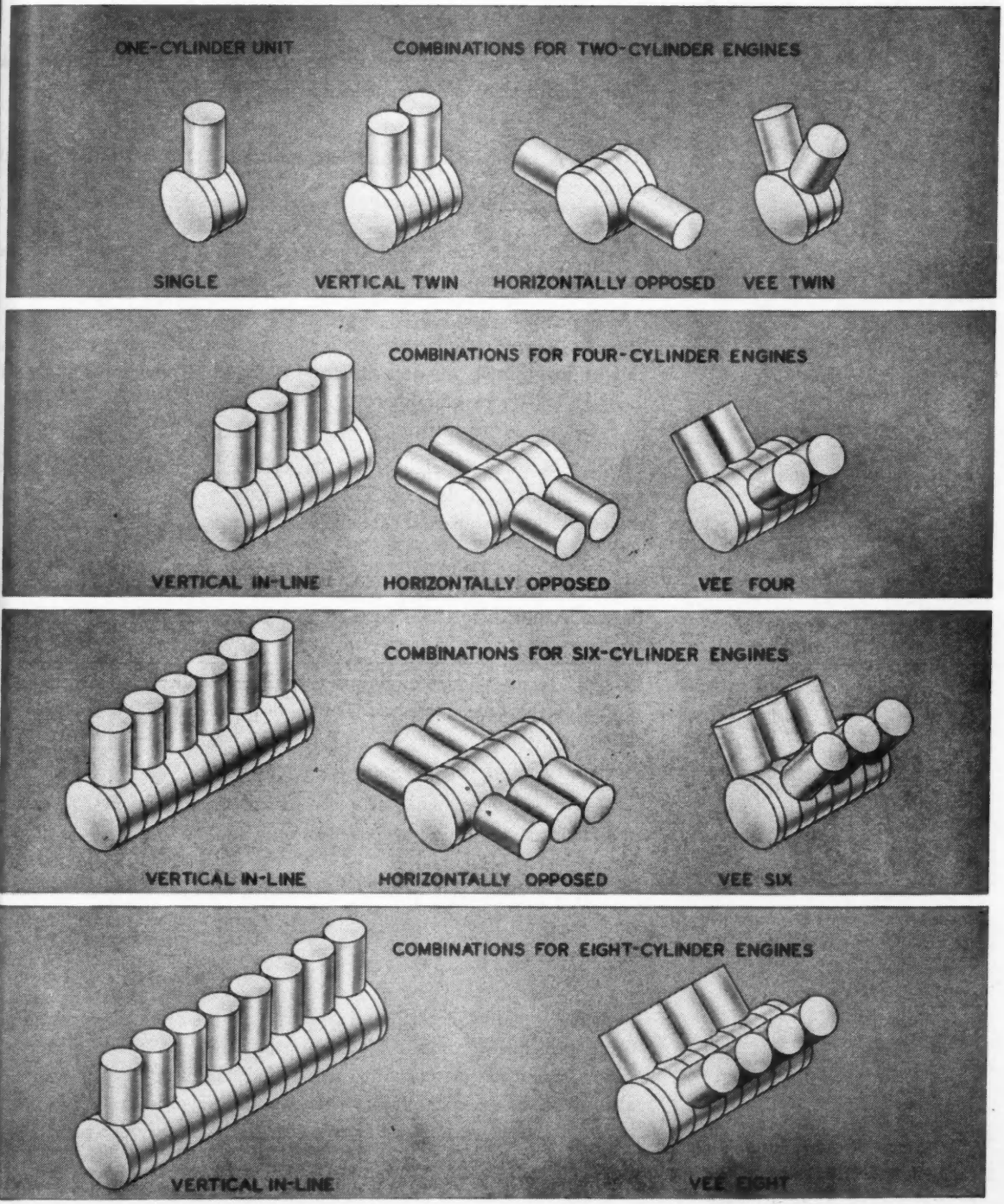


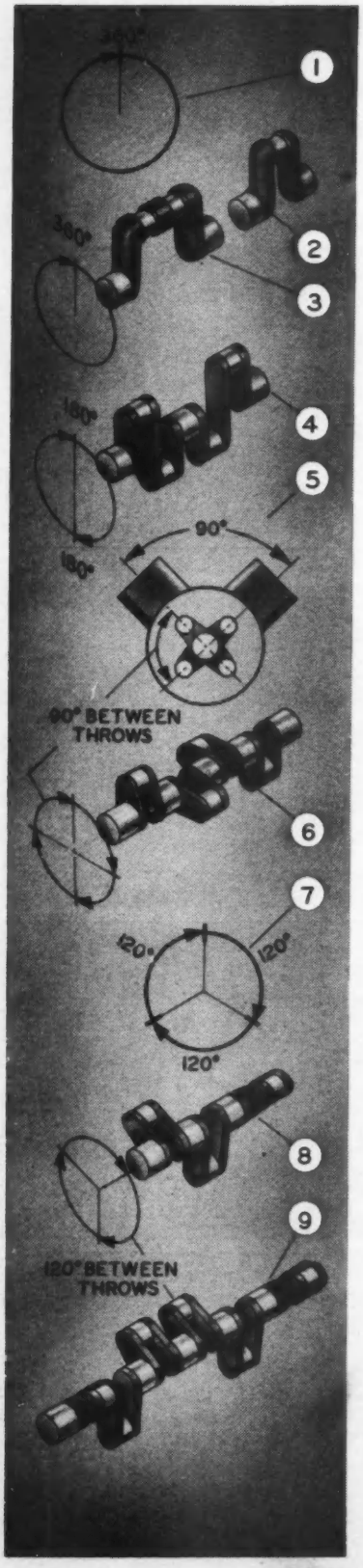
No. 2 of a Series

Last month we discussed how each cylinder of an internal combustion engine is designed to translate the explosive energy of fuel into a motive force. The components shown above are the operating parts of a one-cylinder unit in an overhead-valve, four-stroke-cycle engine. Working in carefully controlled order, these parts form a team which applies the thrust of a piston through a crank to the shaft that furnishes the final driving power. A group of these single cylinders, operating in properly timed sequence, forms the basis of a multiple-cylinder engine. In this chapter we shall see how such an engine is arranged, lubricated and cooled.

by Robert W. Temple

A group of single cylinders—each containing the basic interrelated working parts shown on the opposite page—can be arranged in various combinations and configurations. The diagrams below show most of the types of engines in operation today.





KNOW YOUR CAR

continued

TO OPERATE PROPERLY, the "cranks" or "throws" on the crankshaft of a multiple-cylinder engine must be placed to divide the power impulses evenly between the cylinders.

FIG. 1 Since one revolution of the crank equals 360 degrees, crank spacing on the shaft is designated in degrees of a circle.

FIG. 2 A one-cylinder engine has one crank throw, so it is a 360-degree crank.

FIG. 3 A two-cylinder vertical twin has both throws in line, so it too is a 360-degree crank.

FIG. 4 A four-cylinder engine is just two two-cylinder engines, but half of the throws are opposite for balance and power spacing. This, then, is a 180-degree crankshaft.

FIGS. 5 & 6 A vee-eight is two four-cylinder engines spaced 90 degrees apart, half of 180 degrees. The crankshaft is two 180-degree cranks spaced 90 degrees apart, a 90-degree crankshaft.

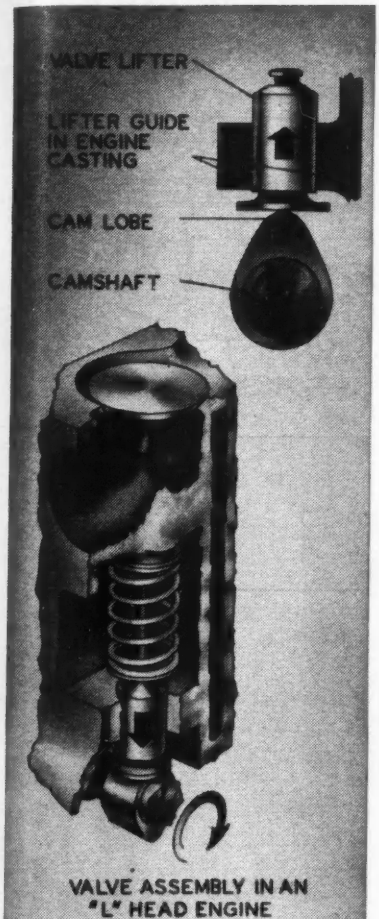
FIGS. 7 & 8 The crankshaft of a three-cylinder engine would divide the circle into three equal parts of 120 degrees each.

FIG. 9 A six-cylinder engine is two three-cylinder engines combined, in line, on the same crankshaft. The spacing remains 120 degrees between the throws.

The two cylinder banks of a vee-six are spaced half of 120 degrees, or 60 degrees, apart.

You will note that all of these multiple-cylinder engines, except the three-cylinder, have cylinders connected to the crankshaft in pairs for alternate firing.

A horizontally opposed engine works on the two-cylinder, alternate-firing principle too. To achieve this the basic two-cylinder unit must have a 180-degree crankshaft. A four-cylinder horizontally opposed engine also uses a 180-degree crank, with two throws per side. A six-cylinder horizontally opposed engine is two opposite three-cylinder banks, so the throw spacing is 60 degrees.



VALVE ASSEMBLY IN AN "L" HEAD ENGINE

A CAM IS A DEVICE which provides motion only part of the time. Since a valve can only be open part of the time, it must be operated by a cam. The part which the cam operates directly is a lifter or cam follower. This lifter is contained in a hole in the engine casing vertical to the cam and can only move up and down, as the cam comes around. The cam pushes the lifter up against the valve stem to raise the valve. The valve is closed by a stiff spring as the high point of the cam passes.

A valve stem gets longer when it is hot but the valve head must close tightly. Allowance for this heat expansion must be provided or the valve would not seat when hot. This is usually done at the lifter. Two types of lifters are used, mechanical and hydraulic.

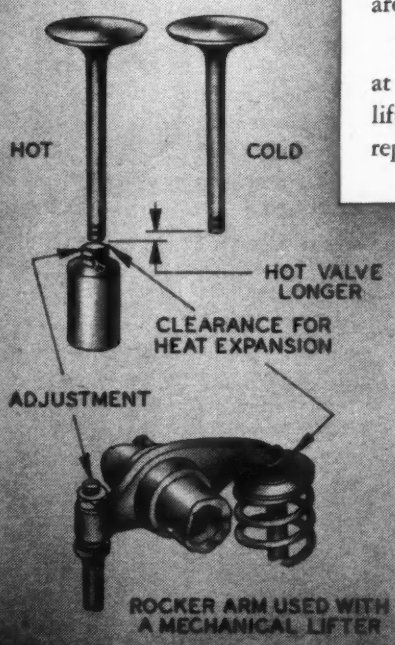
A mechanical lifter as used in L-head engines provides clearance by an adjustable tappet which screws into the top of the lifter. Overhead-valve engines using mechanical lifters provide clearance for expansion at the rocker arm.

The hydraulic lifter was developed to provide automatic adjustment to heat changes and to reduce noise by zero clearance. The hydraulic lifter (A) is hollow and contains a hollow plunger (B). The plunger has a pushrod seat in the top and a hole in the side and bottom. There is a ball check valve in the bottom of the plunger which allows the oil to go out, but not in. A small spring in the bottom of the lifter body keeps the plunger tight against the pushrod at all times.

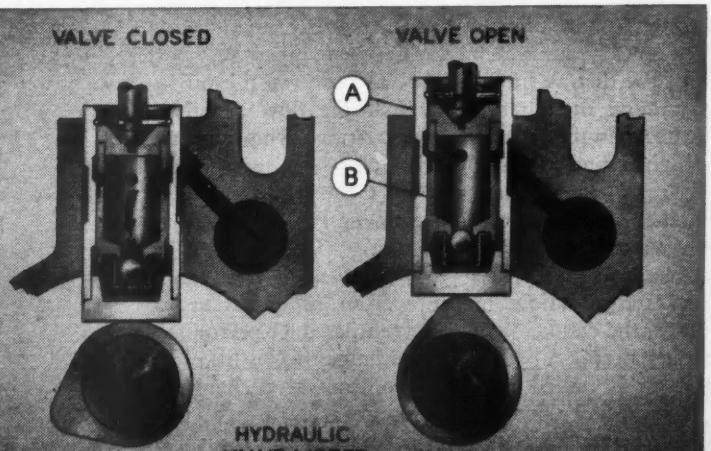
Oil under pressure enters the hydraulic lifter from the oil gallery in the engine. The oil goes through the lifter, plunger and check valve into the lifter base.

As the cam raises the lifter, the oil is trapped beneath the plunger, forming a solid lifter. The oil in the base can escape only by leaking around the plunger. This is known as the leak-down rate.

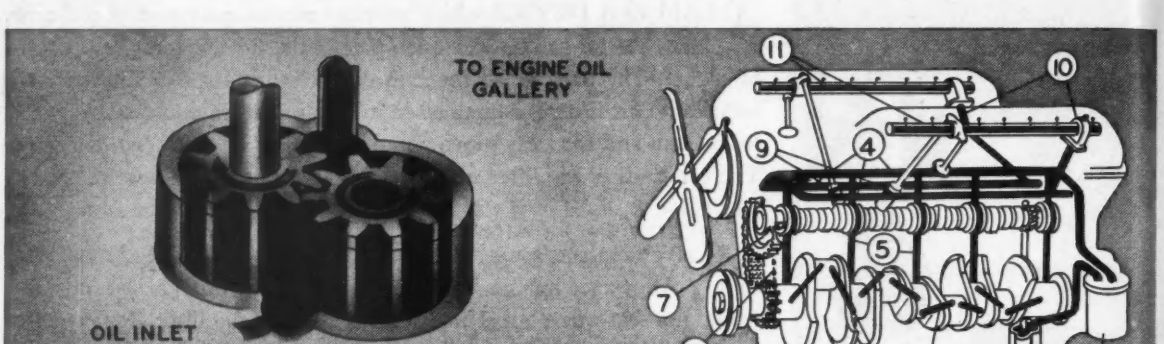
By the time the cam reaches its peak, there is less oil in the lifter than at the start of the lift. This allows room for automatic adjustment in the lifter as it returns to the bottom of the stroke. The adjusting cycle is repeated each time the lifter is raised.

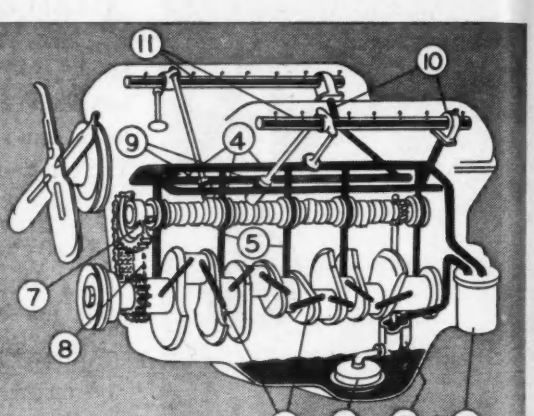


ROCKER ARM USED WITH A MECHANICAL LIFTER



HYDRAULIC VALVE LIFTER



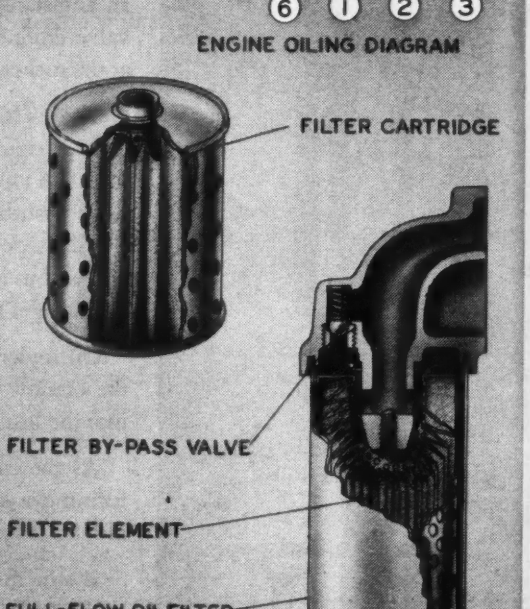


ENGINE OILING DIAGRAM

KNOW YOUR CAR

continued

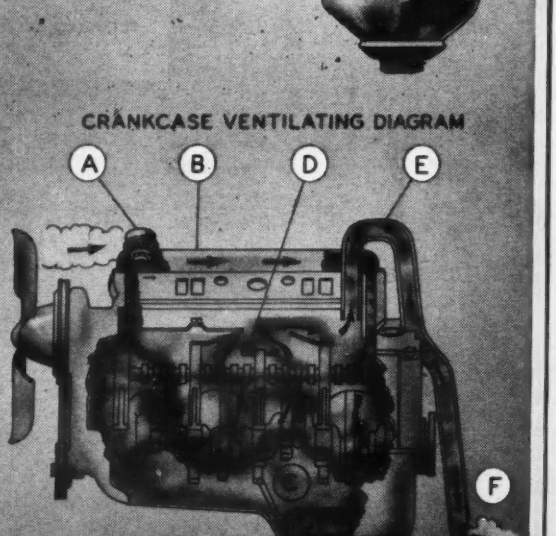
AN ENGINE MUST BE LUBRICATED and all internal parts receive their oil from a common source, the oil reservoir in the pan. The oil is pulled through the strainer (1) by the pump (2) and forced through the oil filter (3) into the engine oil galleries (4). From the central oil gallery, the oil flows to the camshaft and crankshaft main bearings (5) and then through drilled holes in the cranks to the connecting rod bearings (6). Controlled leakage out the sides of the connecting rod bearings throws oil into the cylinder bores to lubricate the pistons. The front camshaft bearing has a passage to the timing gears or sprockets for lubrication in this area (7 & 8). Oil from the side oil galleries is fed to the hydraulic lifters (9) and on up through the rocker arm towers (10) to feed the rocker arms (11).



An oil filter is essential with hydraulic lifters and is usually of the full-flow type. This means that all of the oil, not just part of it, is circulated through the filter. Oil entering the outside shell of the filter is passed through a maze of tiny holes in the filter cartridge or element. The filter element allows the oil to pass but stops the dirt. A filter bypass valve allows the oil to go around the filter cartridge if the flow of oil is greater than the capacity of the cartridge. This happens at high engine speeds.

Engines always have some cylinder gas leakage past the piston rings when operating. This leakage is known as blow-by. To avoid pressure in the crankcase, and to allow moisture from condensation to escape, the crankcase must be ventilated. A perforated breather cap (A) allows air to enter the oil fill-pipe. The air is pulled into the overhead-valve chambers (B) and down into the crankcase at each end (C). From the crankcase the air goes up through the valve lifter chamber (D) and out the breather pipe (E), exhausting under the car (F).

CRANKCASE VENTILATING DIAGRAM

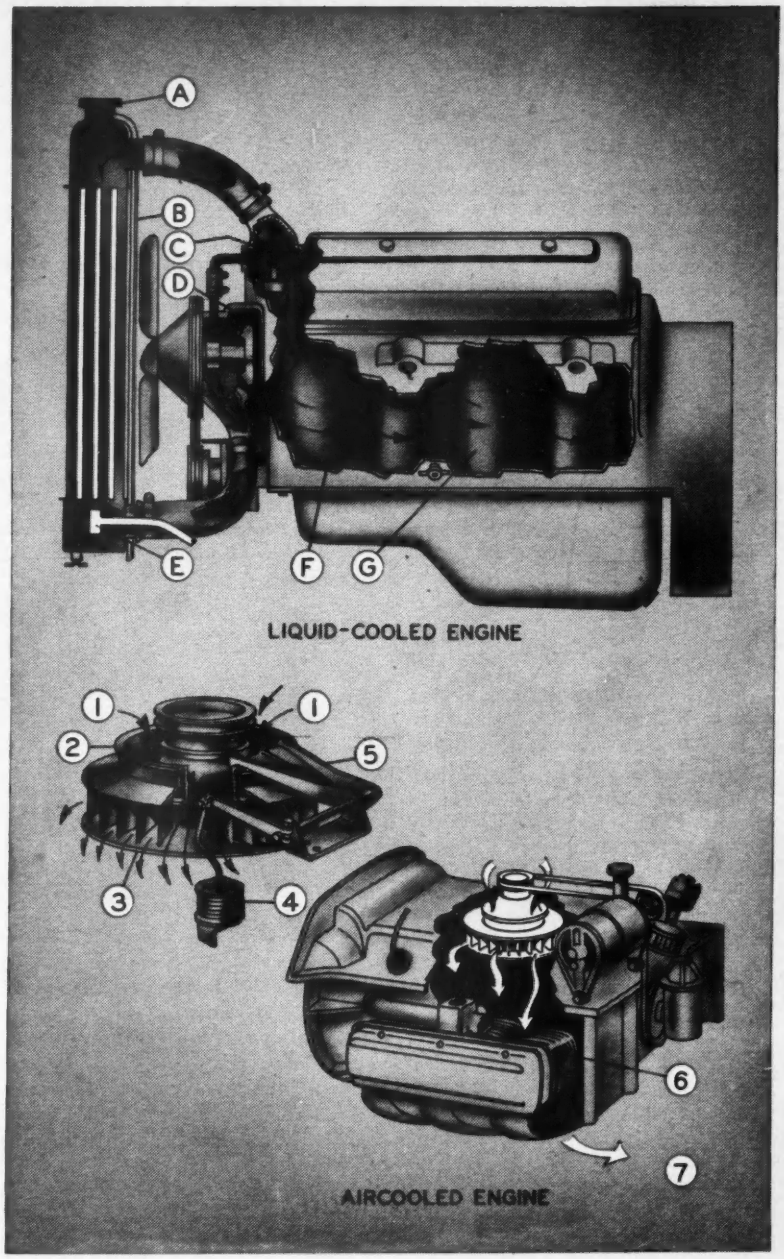


PEAK EFFICIENCY in an engine requires accurate temperature control to prevent the heat of combustion from building up above the operating limits of oil and metal. The usual method of cooling an engine is with water, but some engines are aircooled.

The functioning parts of a liquid-cooled engine are the radiator (B), the thermostat (C) and the water pump (D). The engine has passages or "jackets" (F) around the cylinders (G) and valve ports. The pump forces water through these passages, where it picks up heat from the engine, and then on to a tank on the radiator. From this tank the water passes through a series of long tubes with thin fins on the outside. Air flows across the fins and absorbs the heat which the fins have absorbed from the water in the tubes. The cooled water reaches another tank at the bottom of the radiator where it is now ready to repeat the cycle. The thermostat (C) is a heat control valve. It remains closed, preventing the water from circulating through the radiator until engine operating temperature is reached.

Water boils at 212° Fahrenheit at sea level, and at progressively lower temperatures as altitude increases. By raising the air pressure on the water, the boiling point can also be raised. A spring under the radiator cap (A) presses a lid on a ring inside the filler neck, sealing the radiator. As the water heats, increasing pressure under the cap prevents the water from boiling. Excessive heat, however, will create enough pressure to raise the lid and relieve the pressure through the overflow pipe (B).

An aircooled engine has fins on the cylinder similar to the fins on the tubes of a radiator. Heat from the cylinders is dissipated directly to the air flowing over the fins.



Air (1) is sucked through a control ring (2) by a radial fan (3) which forces the air over the cylinders (6) and out at the rear of the engine (7). A bellows-type thermostat (4) operates a lever (5), which raises and lowers the control ring (2) inside the fan. This increases the air flow as the ring is raised, uncovering a larger portion of the fan, or decreases the flow as the ring is lowered.

NEXT MONTH we will explore the principles and development of carburetion from the simple mixing valve to the modern downdraft carburetor. Fuel pumps and fuel regulators will also be analyzed.

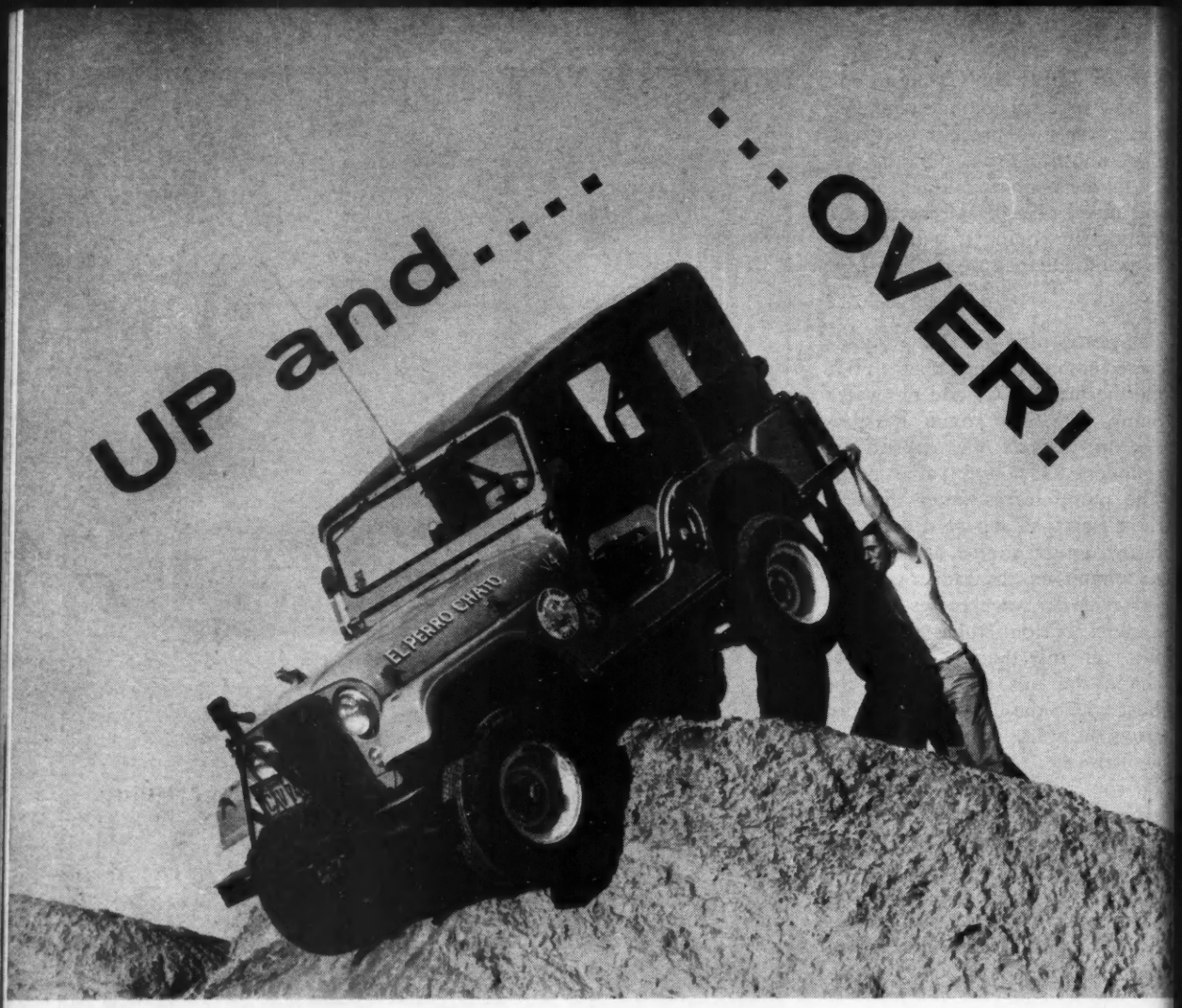


Photo Story by Winson Muldrow

Every hill and dune is a challenge in the annual Rough Riders' Run, where rugged Jeepers tackle rugged terrain in search of four-wheel thrills.

ONE OF THE FASTEST GROWING automotive sports today is organized Jeeping. Beginning with a handful of veterans who remembered what jeeps could do, Jeeping has grown into an activity thousands enjoy every weekend.

With four-wheel drive there is no limit to where a car can go. Jeepers hate freeways, detest highways and can only "tolerate" back country roads that would reduce a passenger car to nuts and bolts. Enthusiasts prefer mountain washes, rocky deserts, untraveled forests, river beds with or without water, muddy swamps or any trail anyone else would drive miles to avoid.

Jeepers, like all automotive enthusiasts, are greatly interested in engineering and their cars are usually modified. Under the hood of a jeep may be crammed a big V8 engine, Burma radiator, four-barrel carburetor, electric fuel pump, power brakes or dozens of other modifications. Suspensions are changed and the spring rate is increased. Custom-built overdrive units are installed, plus heavy-duty protection for oil pans, transmissions and transfer cases. Tires are switched and 8.00 x 15's are the rule, not the exception.

One of the world's most grueling tests of a man and his car is the San Diego Ridgerunners' annual Rough Riders' trek to the Borrego Badlands. In this isolated and barren California desert are hundreds of square miles where only a four-wheel-drive car can safely go. There are rocky mountains, drifting sand, washouts, gulleys and a thousand traps for the unwary driver. But best of all there are few roads—and these are all bad.

Every hill is a challenge and few Jeepers ever refuse to accept. Occasionally even the best driver will misjudge a rolling hill and before he can stop, both jeep and Jeeper are suspended with all four wheels biting air. The only way to get out of trouble is to get behind the jeep and throw the balance on the front wheels.

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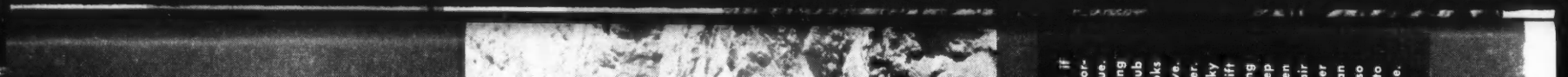
Trailbreaking is often the most exciting part of any Jeeping trip. Generally the route goes over country never before driven by any car. From the last jeep, waiting its turn on the top of the mountain, the road ahead looks smooth and easy to negotiate. But when the Jeeper gets down into the desert, the terrain changes quickly. The trail, which wasn't there before the first jeep crossed, is rough, rugged and tricky. Some sections must be inched over at a walking speed or both jeep and passengers will be shaken to pieces. Driving is an art and the grab handle becomes more than just another fixture—it is a necessity.

Even if the Jeeper has driven any particular strip of country many times he will find it changed on each new trip. Frequently the wind will whip sand across the Badlands and create a new hazard in a matter of hours. Sand traps can be treacherous—hit them too fast, the wheels spin and dig in; shift too slow and the car stalls; shift too fast and power is lost. But these are minor difficulties and solved easily by digging. Within minutes the Jeepers are set to go up and over another hill.

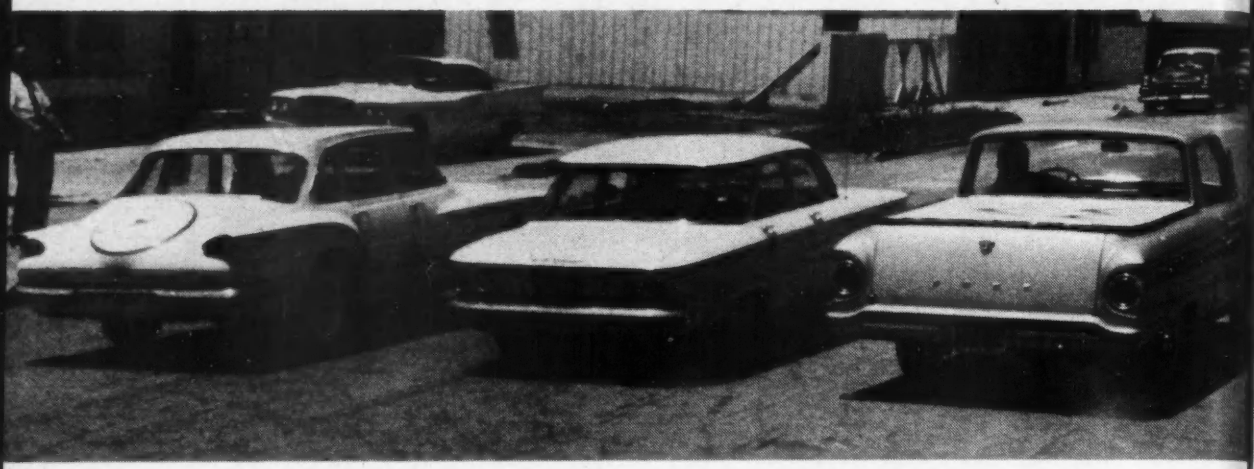
UP and... OVER
continued

A Jeeper climbs a mountain to see if the other side is worse and in the Borrego Badlands this is usually true. Since this is what they were searching for in the first place, the Jeep Club spreads out and each member looks for the worst possible place to drive. The sand traps are bigger and deeper. Sometimes, if the driver is unlucky enough to get stuck, a little push or lift in the right place will get the car going again. Cross-country driving on a jeep trip takes skill; getting clearance often means throwing one wheel in the air and proceeding slowly on the other three. The slightest miscalculation can mean spinning-in the rear wheels so far that the car actually appears to be riding balanced on the spare tire.



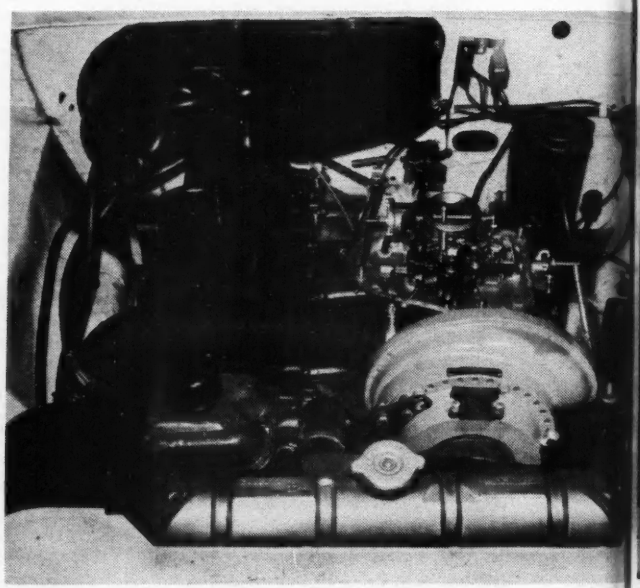
Near the end of the Rough Riders' trek the route became rougher and Jeepers had to have help to negotiate the trail. Washes were deeper, banks sharper and jeeps had to be pushed in. Jeeps mired, and digging, pushing or lifting was no use; only a winch would pull them loose.

THE WAY HOME WAS EASIER THAN THIS, BUT NO JEEPER WOULD THINK OF TAKING THE EASY WAY—THIS IS MORE FUN.



PAXTON SUPERCHARGERS FOR COMPACT ENGINES CUT 0-TO-60 TIMES BY SIX TO EIGHT SECONDS, QUARTER-MILE TIMES BY THREE SECONDS.

COMPACTS WITH GO-



The Valiant's supercharger installation is simplified by the tilted engine layout, which allows plenty of room. Stromberg two-barrel carburetion replaces the normal single-barrel unit for better breathing and colder spark plugs are used. Otherwise, the engine is completely stock. The increase in power is said to be more than 60 per cent! Even better results are likely with the Valiant's new ram induction manifold option.

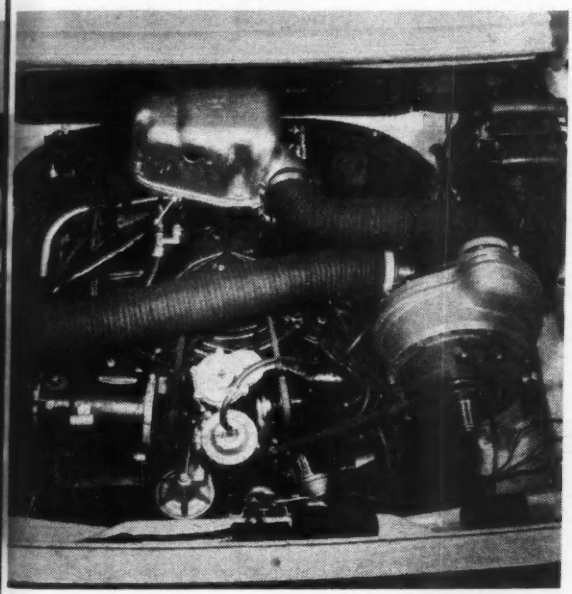
Here are reports on five compacts that have boosted their go-power with a blower or a bigger engine... and can burn rubber to prove it!

TAKE A LIGHT, COMPACT BODY integrated with a nimble chassis. Add plenty of horsepower and you can have a really exciting automobile. That is just what some performance enthusiasts are doing. Detroit has provided them with the Corvair, Falcon, Valiant and Comet, all cars of convenient size and easy handling. And they are finding horsepower to spare with two classic techniques.

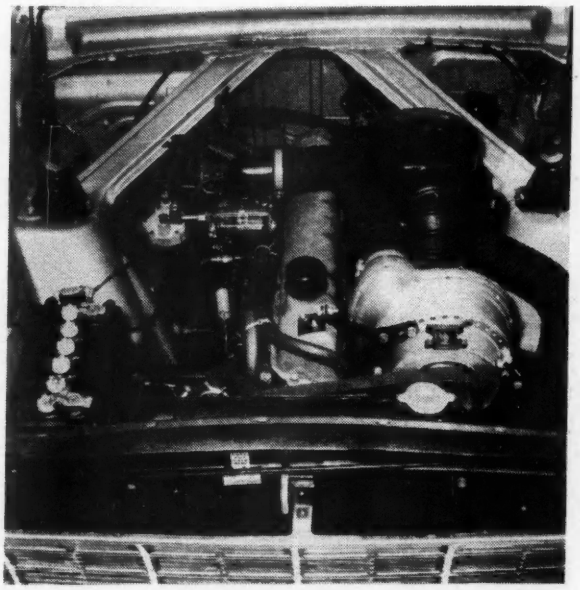
The first is supercharging. Paxton Products of Santa Monica, Calif. has developed a special version of its famous centrifugal blower for compact engines. It is smaller and simpler than its full-sized equivalent but still packs quite a wallop, delivering 10 pounds of boost at 6000 rpm. Prototype installations have proven successful in the Corvair, Falcon and Valiant.

The second method is even more effective and, needless to say, more expensive. It consists of replacing the compact six-cylinder engine with a big V8. Two first-rate efforts are a Mercury-powered Falcon built by Bill Stroppe of Long Beach, Calif. for William Clay Ford, vice president of the Ford Motor Co., and a Comet with a Chevrolet V8 owned by Wally Parks, editorial director of MOTOR TREND. Such conversions are not cheap. Stroppe estimates a duplicate of Ford's Falcon would cost $2000 more than the car itself.

But money is a secondary consideration for the lucky owners of these cars. If they had wanted economy, they would have left their compact, six-cylinder engines alone! Why not take advantage of the opportunity to increase power-to-weight ratio?



On the Corvair engine, the Paxton supercharger is again teamed with a Stromberg two-barrel carburetor, enclosed in a cast-aluminum air box to minimize leakage from the added pressure of the blower. A special intake manifold is substituted for the standard dual system. Paxton is to offer a complete kit for each compact engine that contains everything from air cleaners to manifold adaptors.



For both Ford compacts, the Falcon and Comet, the same supercharger arrangement is used. The specific example shown above, a prototype on a Falcon, borrows a single-barrel carburetor from the Ford Six but a Stromberg will be included in the production kit. The new Paxton unit, designed especially for smaller engines and catalogued as the SN-60, delivers 10 pounds of boost and costs $299.50.

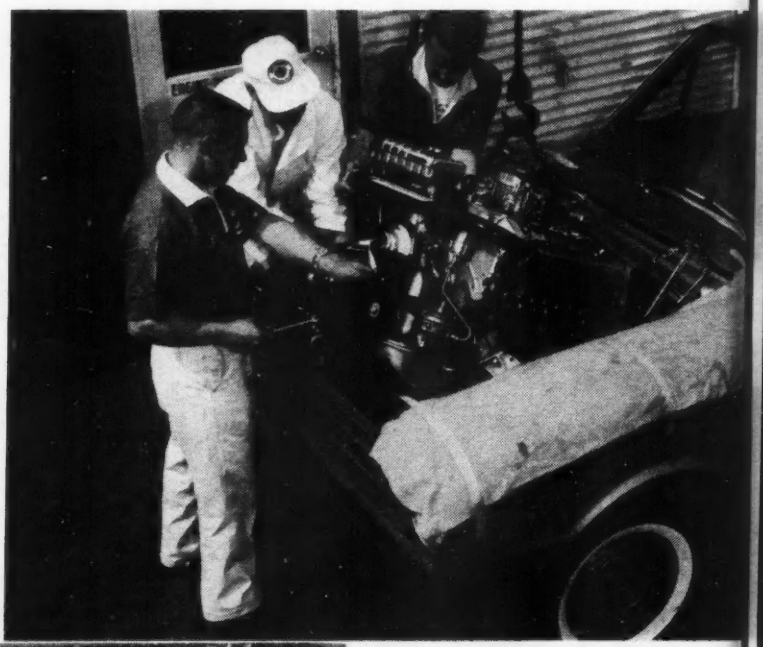
PACKS

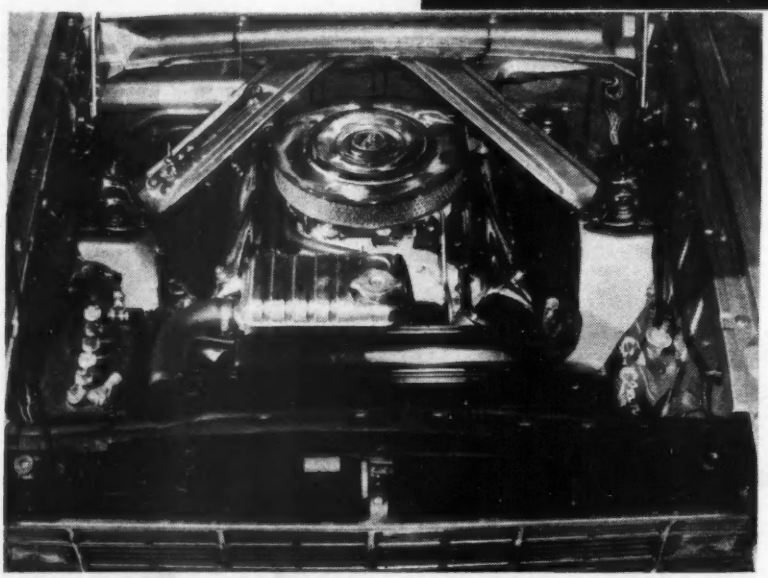
GO-PACKS
continued

A 312-cubic-inch Mercury V8, together with Cruise-O-Matic, provides power for William Clay Ford's Falcon sedan.

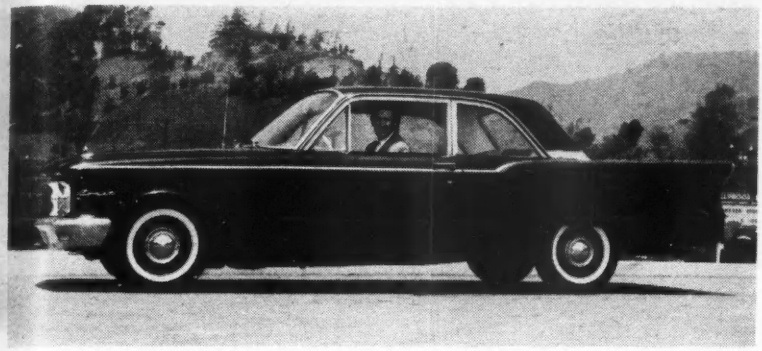
Falcon with Merc V8

Ford's car was built by Bill Stroppe. As the first installation of its kind, the Mercury V8 engine had to be tried for size in the Falcon several times before it was set firmly in position. Both the spring housings and firewall brackets had to be reshaped slightly for proper clearances. In addition, the Cruise-O-Matic transmission meant a larger floor tunnel. A '59 Ford rear axle assembly is used and provides a 3.10 ratio. Except for stiffer coil springs in front, both the suspension and braking systems are stock, ample for extra load.



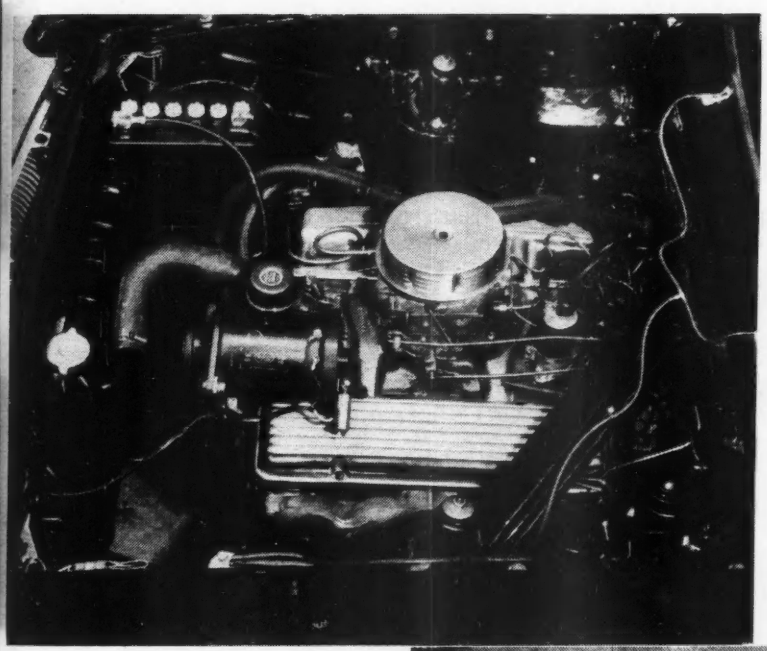


Mild souping adds still more power t the Mercury engine. Bored .060-in over stock, it actually displaces 3 cubic inches. The compression rat has been raised a point to 10 to 1 a the carburetor is a four-barrel. T cam is a street grind by Racer Brow For efficient cooling, the cross-flo radiator has been adapted from a For



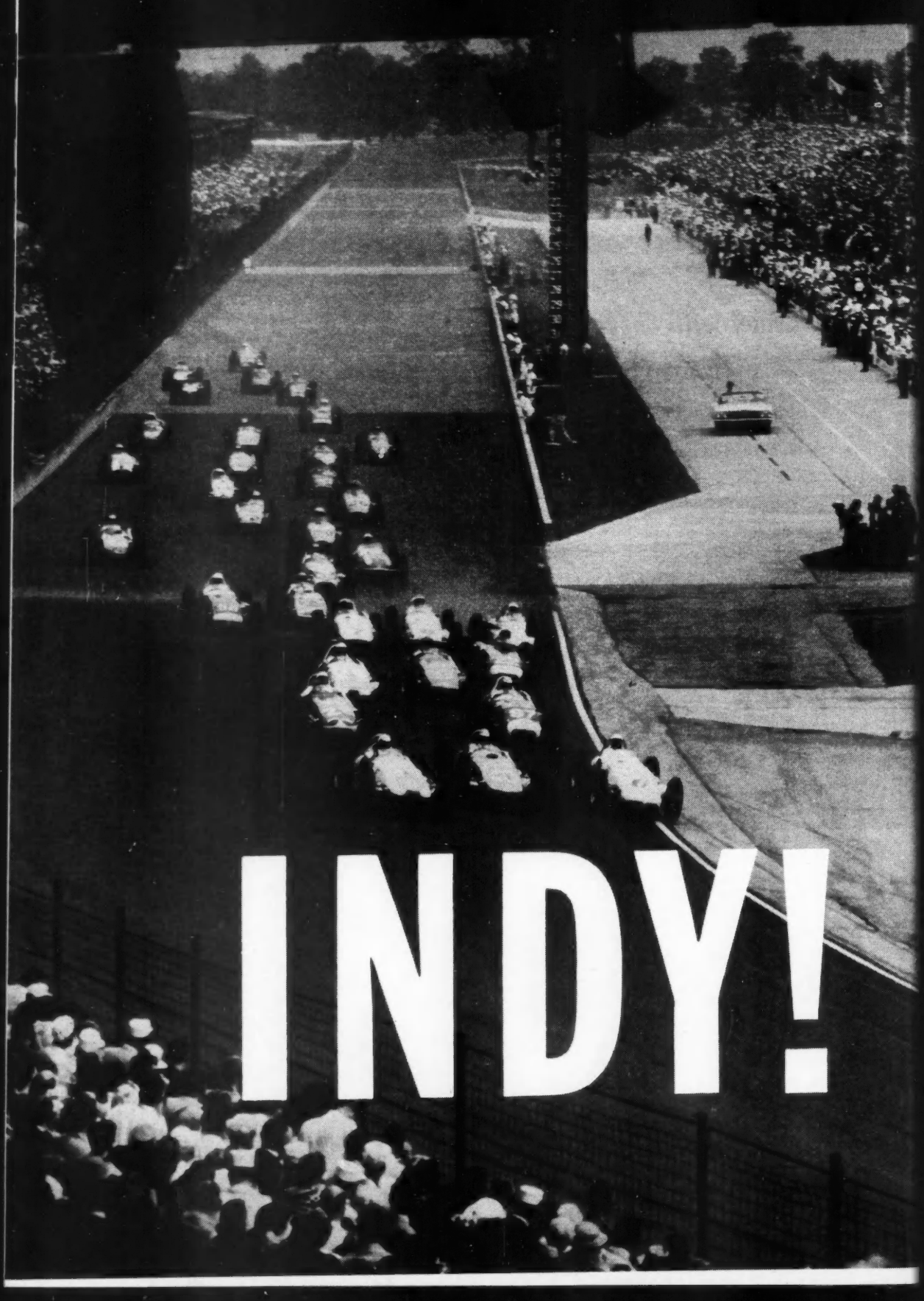
Wally Parks, editorial director of MT, had a 283-cubic-inch Chevrolet V8 and Powerglide installed in his new Comet.

Comet with Chevy V8

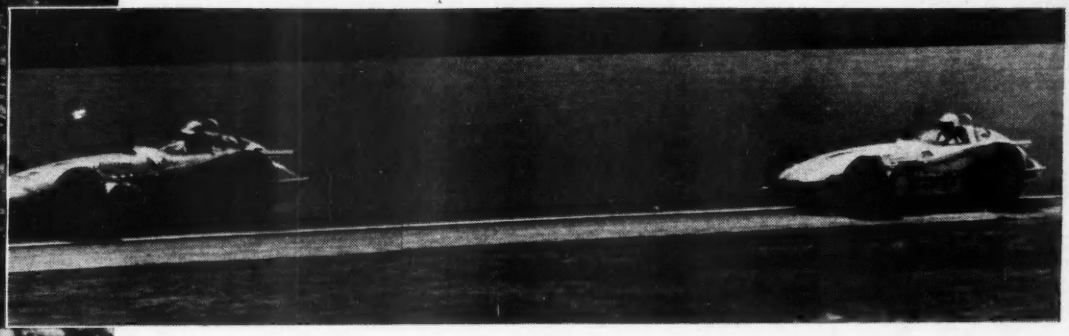


The engine is a standard Chevrolet V8 with four-barrel carburetion. Only a few structural components were touched and none had to be seriously modified. For example, the coil-spring housings were dimpled for an easier fit but no cutting was needed. The front engine mounts were adapted from Hurst units designed for installation of the Chevy V8 in a '40 Ford. The original Comet parts were retained wherever possible, including both the radiator and a 3.56 rear axle. The steering link had to be lowered to clear the deeper V8 pan.

Because the Chevrolet V8 is actually shorter than the in-line Comet Six, it was necessary to lengthen the driveshaft and place the rear engine mount further forward. For the latter, a special bracket was extended from the crossmember. This placed a heavier stress on the member, forcing use of an extra brace as shown at the right.


INDY!

A fraction of an inch of rubber gave **Jim RATHMANN**



...the margin to win over **Rodger WARD**

by Charles Nerpel

PHOTOS BY BOB D'OLIVO, CHARLES NERPEL, RAY BROCK

THE 44TH RUNNING of the 500-mile Indianapolis race was a contest of attrition. Despite a long list of broken records, and the contention that a stalled engine during one of his pit stops cost 2nd place finisher Rodger Ward the victory, equipment wrote the final chapter. In the case of Jim Rathmann and Rodger Ward, the equipment was tires. Behind these terrific pace setters, 14 cars out of the 33 starters were left to take the checkered flag—some running smoothly but without the power and speed to keep up with the leaders, others like Johnny Thomson, an early charger, limping into 5th place with a badly smoking engine due to a broken valve.

Mechanical failures played no favorites as veteran and rookie alike sat on the pit wall behind their tired racing machines and watched the rest of the boys go by. Built to go and endowed with almost human temperaments of their builders and drivers, those that failed did not give up easily. For some the end was as spectacular and thrilling as the final duel between the leaders. Veteran Tony Bettenhausen rode his smoking car into the pits perched on the back of the seat to avoid heat and smoke from an engine oil leak that trickled for several laps before reaching the red-hot exhaust pipe. Jim McWithey ricocheted off a long stretch of the inner pit wall as he attempted to stop with no brakes, pit crews scattering like flies to make room for his tires to snub against the wall. Veteran Don Branson almost wiped his Bob Estes Special from the list of finishers when excessive speed into the pits caused him to spin as the brakes were applied hard, but he avoided any damaging contact and after a change of tires and refueling continued the race to a 4th-place finish.

Accidents were few, considering the pace set early in the race and never let up. The yellow light was on less than 30 minutes due to spins by Chuck Stevenson and Duane Carter, both of whom called on all their driving skill to keep their cars under control and continue the race after a mandatory pit stop for tire change. Not so fortunate was Eddie Russo, who overran his tire-wear margin of safety and crashed into the wall. Other drivers and crews were cutting tire changes close, as evidenced by one of Johnny Thomson's threadbare skins letting go as he entered the pits to change it.

In this race of attrition, or the ability of 33 pieces of nearly identical equipment to outlast each other, it is obvious that the most important component is the driver behind the wheel. It is pure speculation to assume that one car might have placed better than another with a different driver, but there can be no guesswork about the skill, stamina and good judgment required of those who set and followed the pace of what has turned into a 500-mile sprint race.

Face the decision that both Ward and Rathmann had to make in the closing laps of the race. Earlier they had been squeezing about 48 laps out of a set of tires, maybe a little more as they slowed for the yellow light. They knew, and the pit crews knew after both cars pitted together in the 148th lap, that at best the 52 laps remaining in the race were going to see those tires right on the hairy edge, and hairy in its literal sense, as tires worn into the cord have a fuzzy or hairy appearance to the driver as they spin at 150 mph plus. Add to this the lead-changing duel between the two cars that further increased tire wear as each went deeper into each corner, lifting the inside front wheel a little higher as throttle was applied in the turns and the lap speeds went up and over 145 mph.

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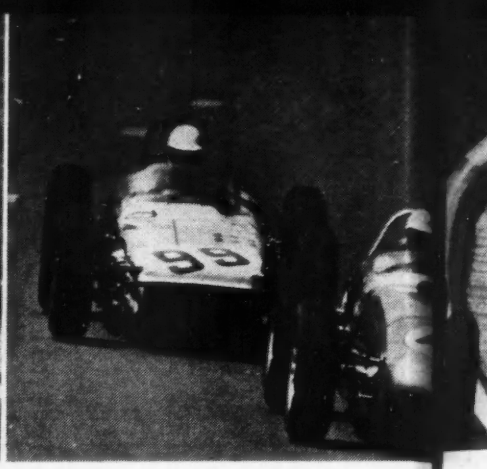
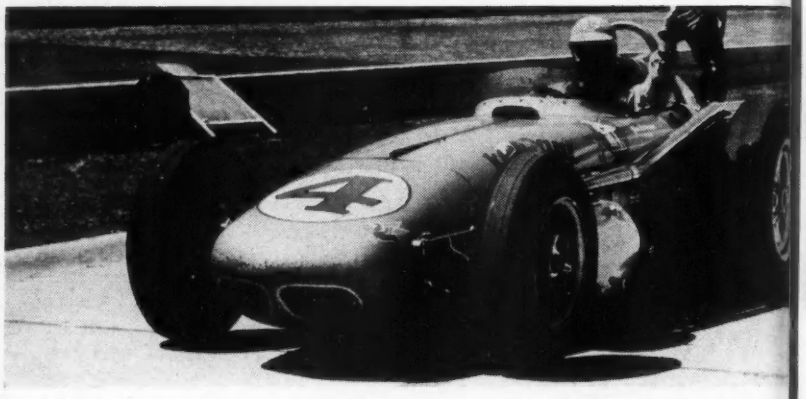


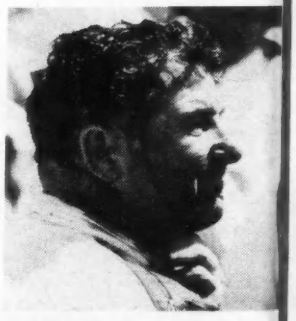
Rookie Jim Hurtubise pilots the Travelon Trailer Special to a new qualifying record of 149.05 mph for 4 laps, just a fraction under 2½ miles per minute.



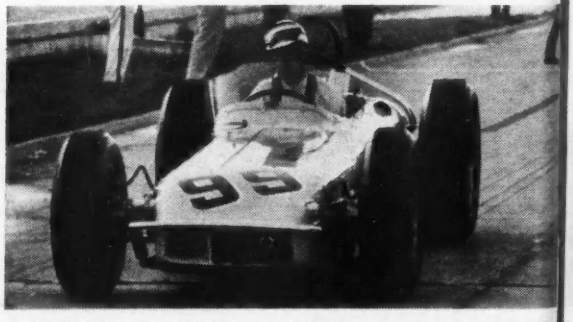
Jim Rathmann, after two previous 2nd place finishes, waves as he rolls through the pits on his way to Victory Lane

INDY!

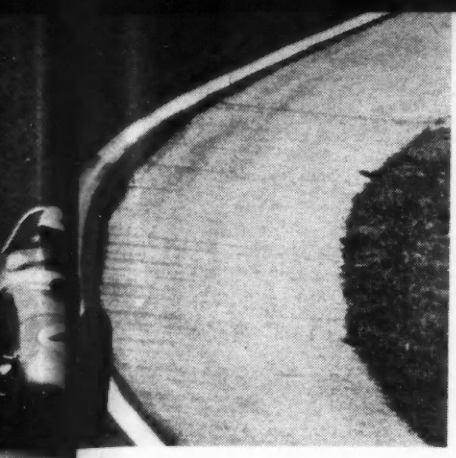
continued

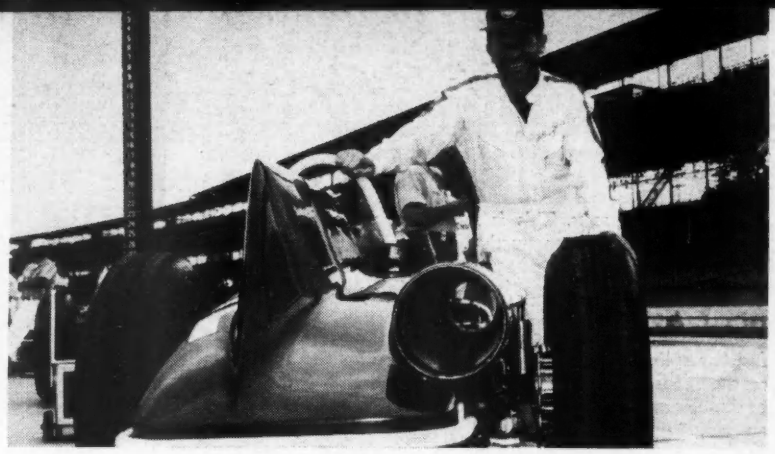


Rodger Ward had to cut his duel with Rathmann and settle for 2nd spot because of badly worn right front tire (left).



Paul Goldsmith, driving the Demler Special in which he placed 5th in 1959, moved steadily behind the leaders to finish 3rd from 26th starting position in this year's classic. His 136.792 mph was 2 mph slower than winner's





Eddie Johnson completed the 200 laps for 6th place in one of the Robbins Specials that featured a straight-through engine ventilator.

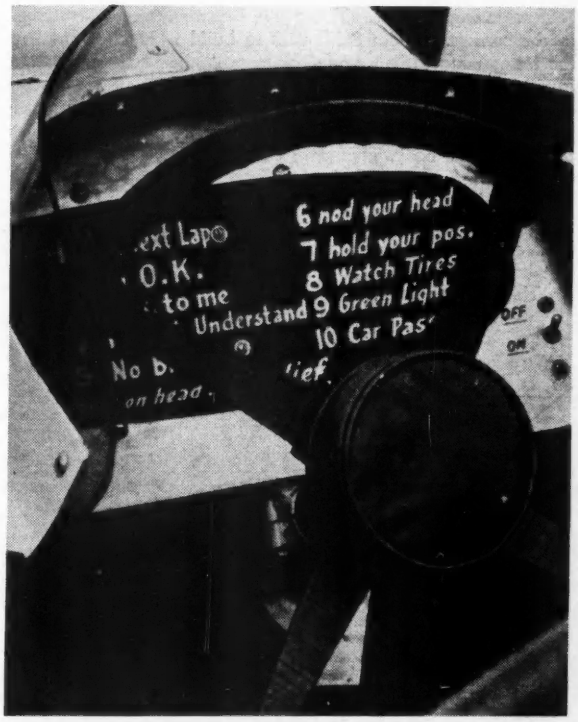
Firestone put a lot of extra rubber into these tires, anticipating such extra wear, and each driver had been briefed several times prior to the race by Firestone technicians displaying sections of tires in various stages of wear. One tire sample they did not have is the one they are sure to cut from both Rathmann's and Ward's, of tires worn well past the point of no return, but still running.

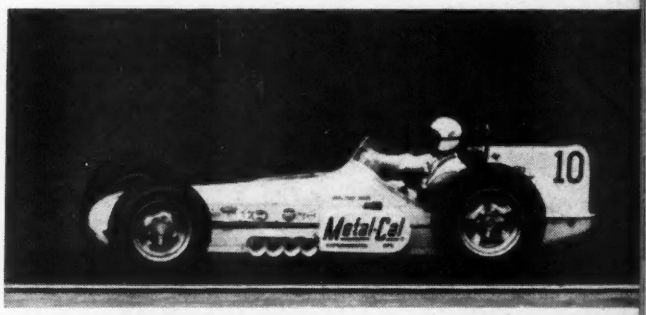
Rathmann's story of the race was puzzling. He said Ward could pull him coming out of corners and pass him in the straights, yet he managed to swap leads with last year's winner some 15 times in the last 195 miles and was never more than a few ticks of the watch behind him even when Ward was in the lead. That extra acceleration out of the corners was costly on tires for Ward as it gave Rathmann that extra lap or so at speed while forcing Ward to slow and settle for 2nd place in the closing laps. Both knew they were well into the tire danger zone and both thought of pitting but decided to take the risk and try to finish without giving up position. Naturally, only one could win, but the skill and judgment of both drivers were the only things between them and certain disaster.

So much for the man-machine combinations—now for the machines themselves. Years of racing on the 2½-mile paved four-turn oval at Indianapolis have developed a pretty well established basic formula for engines, chassis and suspensions. Of the 66 cars that filed entries for the race, 62 were basically the same—deep double-rail tube frames; Meyer-Drake Offy engines, clutches and gearboxes; Halibrand rear ends, axles, brakes and wheels; and individually adjustable transverse torsion bars front and rear. The variations of arrangements of components are infinite and the builders try them all, with none having more than a slight advantage over the other.

A. J. Watson, California's builder of many winners who had four of his cars in the top 10, including Ward and Rathmann, believes in straight-up engines offset for leftside weight shift with the driveshaft alongside the driver. George Salih likes the layover powerplant, small, light cars and low frontal area with which he was successful, Sam Hanks winning in 1957 and Jimmy Bryan in 1958.

Lujie Lesovsky built the car that Johnny Thomson drove to 3rd position in 1959 and Johnny was back this year in the same car and was moving well until a broken valve forced him back in the pack where he finished a smoking 5th. A new car by Lesovsky this year failed to make the starting line-up after it was flagged in during qualifying because the crew thought Jack Turner's 141 mph was too slow. They did not have another chance as time ran out, but this car was a refined version of the Thomson car with driver seated to left of driveshaft, inclined engine, and very low frontal area. Driver comfort has always been a major factor with builder Lesovsky, who uses a special "breathing"-type fabric upholstery on his scientifically





Gene Hartley's Sumar car (upper) had code on dash that corresponded to numbered pit signals. Jimmy Bryan (above) could not get the expected speed from George Salih's new Metal-Cal Special, gave up at 152 laps with bad fuel pump.

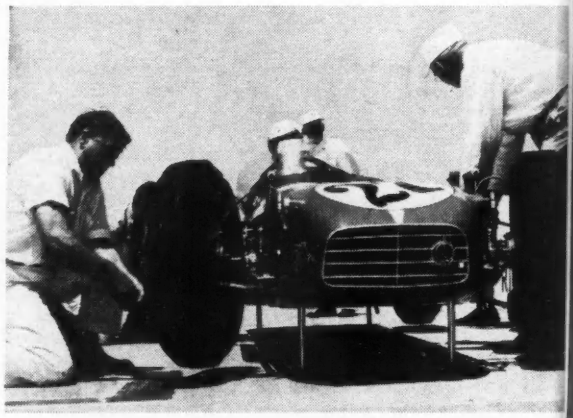
INDY!
continued

designed driver's seats. This is fairly easy when the driver is known at the time of construction.

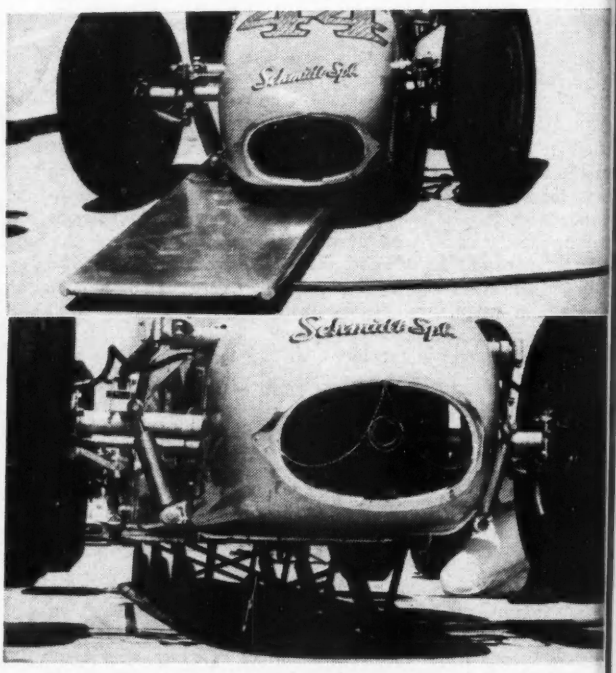
George Salih had one of the smallest cars in the race, with seating designed for Jimmy Bryan, one of the biggest drivers in the business. Salih had an interesting application of the familiar crossed front torsion bars on his tiny yellow racer. Instead of the full bar splined to the suspension trailing arm and adjustable on the opposite side, Salih's bars were split, each half the length of those normally used, linked together in the center of the frame and adjustable at the wheel they were suspending. The set of bars for each wheel consisted of one of smaller diameter or different spring rate combined with a larger bar, which allowed more flexibility of motion. This setup appeared to be heavier and more complicated than the single-bar construction, and at least during the race, did not give Bryan any great advantage in the corners. Builder Salih tries to build light cars, figuring the fewer pounds the engine has to pull, the better and faster it will be.

Other builders try various ways to reduce this weight, and several cars employed "wet tails" where the fuel tank itself forms the rear of the body. This saves close to 100 pounds but some of the saving goes back into a mandatory wrap-around rear bumper of heavy steel tubing. The imperative need for self-contained air jacks that one must have to compete with others in fast pit stops also adds weight. It is possible that additional weight could be saved with a lighter rear center section and additional horsepower put to the wheels instead of chewing it up in a quick-change gear train that all the cars have but seldom use, as the rear-end ratio is pretty well established for this engine and track.

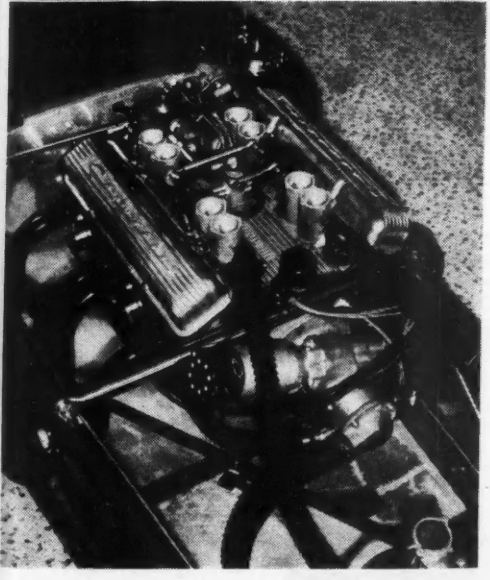
Speedway fire department emergency crews had new flame-proof suits to assist drivers trapped in burning cars.



Most cars employed chassis-mounted piston-type jacks to speed tire changes. Others used platform pad (below) that requires accurate driving to center car before it can be lifted. Both systems use compressed nitrogen instead of air.



(Left) Story of the Novis: much work and worry by chief mechanic Jean Marcenac, fuel mixture problems, blown superchargers, fried pistons—back to drawing board for another try.



Every component of these cars is so highly stressed that the parts that fall by the wayside in failing to pass Magnaflux amount to a small fortune. Seven Offy crankshafts, as an example, at $900 each, were cracked after rather short practice runs. The front axle of the Travelon Trailer Special, fastest car at the speedway, was found to be cracked halfway through after Jim Hurtubise's near-150-mph lap.

This performance by Hurtubise, dirt track veteran but a rookie at Indy, had the crowd on their feet, first wondering if all their stop watches had suddenly gone bad at once, then cheering when they realized how close this young newcomer had come to lapping the 2½-mile oval in one minute. Saturday, beginning the last qualifying weekend, was a day of high winds and ominous clouds. When the green light went on, signifying that the course was open for qualifying or practice, Hurtubise was the first out to practice and he was timed at 145 mph plus for several laps. Satisfied, he pulled in and a short time later Duane Carter took the course but refused the green qualifying flag after his warm-up lap because of very strong, gusty winds that made handling on the main straight next to impossible. This decision was good enough for the rest of those waiting to qualify and the cars stayed in the pits waiting for the wind to die down. The next day, Sunday, this young rookie shattered all of the Indianapolis lap records.

Among the non-conventional cars that arrived to have a try at beating the Offys were the perennial Novis, headed by chief mechanic Jean Marcenac, and two Chevy V8-powered machines from the West Coast. Marcenac had a full year to prepare the supercharged V8 Novis, including high-speed runs on the dry lakes near Los Angeles, but he seemed plagued with the same problems of fuel mixtures and holding the blower impellers together. Paul Russo exploded one early in the month but it was replaced, including repairs on the aluminum nose, in time to try to qualify. Meanwhile, Dempsey Wilson was practicing with the other, and the unmistakable whine of the blown V8 coming down the straights indicated that at least one of these favorites would be in the line-up. Then things began to happen and both cars were withdrawn with fried pistons. Wilson took over Jimmy Deywalt's ride in the Bryant Heating car which was qualified for the 26th spot but was moved to last place by the USAC stewards due to Wilson's unfamiliarity with the car. Russo was grabbed to drive Lujie Lesovsky's new speedster but time ran out before he could qualify and he spent the rest of his time briefing nephew Eddie Russo for his ride in the Go-Kart car. *continued on page 81*

Driver Al Keller stands by as Bruce Crower and crew make adjustments to Chevy-powered car. Highly modified V8 is offset to left and tilted almost 50 degrees to the right.

Chevy engine in Chuck Cheneworth's car uses stock block, Corvette crank hard chromed, and Hilborn injectors. Engine is offset to left, straight up, has baked enamel headers.

The Simple Facts on SPARK PLUGS

It all depends on the type of driving you do . . . but here are some tips about heat range and trouble signs that should take the guesswork out of which plug is the best for your needs.

by John Christy

THINK OF A COMPONENT PART that must withstand extremes of pressure, heat, blasting by foreign objects, and then immediate chilling—with one or another of these conditions occurring one to four thousand times a minute (depending on whether the engine is two- or four-stroke), and going through the whole cycle up to two thousand times in a minute.

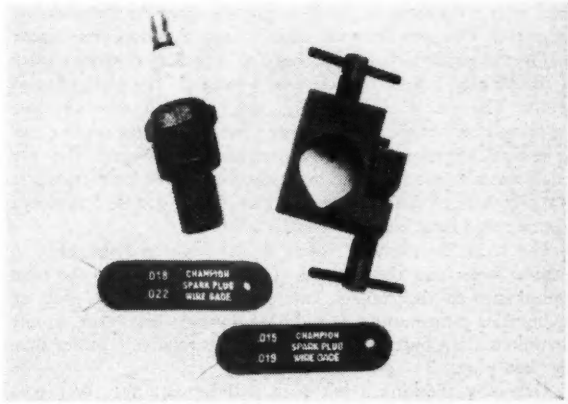
What comes to mind? Rocket part? Jet component? Nose cone? Nope, nothing so esoteric or glamorous. The item that takes this thermal and mechanical drubbing is nothing more or less than the simple one-dollar spark plug.

One of the most essential parts of any internal combustion engine, save a diesel, the spark plug is so important that most engine designs or at least head designs start with that point. Without it there is no way a gasoline engine can work regardless of equipment, complexity or fuel. With the wrong one you might just as well burn a tar of old socks as high octane gasoline for all the work the engine is going to do—or if wrong in another direction it would be just as simple to load it up with nitroglycerine and drop it off a cliff; the effect would be similar. Nonetheless, this vital piece of equipment is probably the most abused, neglected, cursed and misunderstood item in the modern automobile. Let's take a look at what happens to a plug in one cycle or two revolutions of a four-stroke engine:

First comes a chilling draft of fuel-air mixture, sometimes colder than the outside air, as the intake stroke begins. Suddenly, as the compression stroke begins, the plug is subjected to immense pressures as high or higher than 200 pounds per square inch and then is expected to throw a current of electricity across a gap. The minute it does this it is hit with a searing blast of flame, the heat of which drops off sharply with the pressure during the power stroke. Instantly, it again is slammed with a spray of carbon particles moving with about the same velocity as a charge from a sand blaster, then is immediately chilled again as the next cycle starts.

Under normal operation the plug is expected to undergo this torture on the average of a thousand times a minute for miles, hours and even months or years on end. In addition, it is expected that the plug will unfailingly fire at the proper millisecond, continue to hold compression and not foul or deteriorate from the oil that passes the rings and valve guides, the carbon deposits that get thrown at it and the lead salts that build up on the insulator. It is further expected that this small item will put up with all this nonsense under extremes of operating conditions, engine loadings and speed variations without burning its electrodes into metallic sponge. Hidden as it is in the modern car under areas of tin and hot exhaust piping, the plug—as a final irony—gets only the scantiest of attention, usually during a semi-annual process euphemistically called a "tune-up" by the corner cretin who sold it to the average motorist. This worthy either throws the poor thing away as a dead loss or gives it a shot of sand and air and then stuffs it back in the hole to take another six months of the sort of punishment that would give the average nose-cone designer fits.

The wonder of all this, and a tribute to the people who make and sell these important little pieces of equipment, is that the spark plug takes this abuse as much as one mile—let alone 10,000. Many motorists expect even more and for this reason find themselves with a smoldering engine six miles out on a country lane from West Fencepost or stalled at some convenient spot like 44th and Madison in New York, Seventh and Spring in Los Angeles, or Wacker and Michigan in Chicago at rush hour. Such is only just retribution for over-abuse.



Dual-purpose gapping clamp made by Champion for setting point clearances on side electrode plugs has provision for pushing electrode in or out to effect proper gap.

The first step to helping plugs stand the abuse is to select a plug of the proper heat range. Failure to do so can result in more than merely a mistreated plug. In some cases, the selection of a plug in the wrong range can turn the plug itself into a hot spot and lead to the destruction of the engine. In others, the result is a blubbering loss of power. That this can be serious was brought home to the author one time in a road race. A plug range which had worked admirably on a high-aromatic fuel was

The Simple Facts on SPARK PLUGS

continued

used with a different brand in a different part of the country. Forgetting that the aromatic content and therefore the latent heat of evaporation changes in gasoline supplied to various parts of the country, I went blithely ahead and used the same plug as before. The result felt more like an over-rich mixture than anything else, but the loss of power was evident on coming out of a turn when the needed horses went elsewhere. The net result was a spin-out and an expensive repair bill for metalwork. Happily I didn't just proceed to lean things out or a wrecked engine could have been the penalty.

The term "heat range" refers to the ability of the plug to conduct heat from the business end and pass it on to the head and thence to the coolant, not to the effect of the plug on combustion temperature. A cold plug transfers heat more rapidly than does a hot one; *i.e.*, a cold plug stays relatively cooler than the hot plug.

Generally speaking a hot plug will be used for those conditions where it will retain heat and so remain unfouled under stop and start conditions, slow engine operation and cool weather. Such a plug, subjected to high combustion chamber temperatures, heavy loadings and rapid cycling due to high-speed operation would literally "fry" in short order, burning its electrodes and calcining its insulator. Or it could turn incandescent and so cause destructive pre-ignition and detonation.

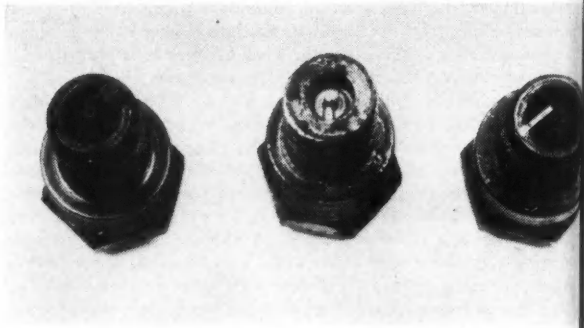
A cold plug, on the other hand, would withstand the high-speed operation without burning due to its ability to pass off the heat faster and so maintain an evenly optimum temperature. Subjected to stop and start, heavy traffic use, however, it would immediately "load up" with raw fuel and oil, and foul or short out across the electrodes and so misfire. The plug that comes with a car from the factory is usually selected for average driving conditions and is generally on the hot side of the ledger. Usually it is the coldest plug the factory engineers think can be used under those conditions, still retaining an ability to withstand the effects of oiling occurring in a new engine and to burn the stuff that Joe Doe usually feeds his car.

Unfortunately there is no hard and fast rule to tell what plug is best for what condition in a specific engine. Combustion chamber design, compression ratio, valve timing and fuel all have a bearing on the range that will be used, as does the use to which the engine will be put. The best bet is to start with the recommended plug for the stock engine if you are working with a street machine or dual-purpose car and keep using colder and colder ranges until you find one that loads up. The step hotter than the one that loaded is the general-use plug you will want. The one that loaded under normal use will be the high-speed plug to use for such things as drags or fast cross-country hauls. For city use, go another step hotter.

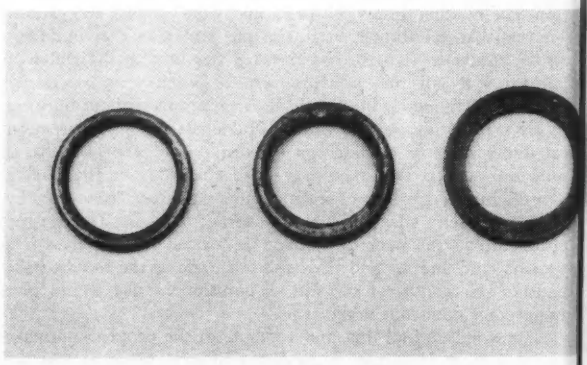
This, however, is a rough guide only. It is definitely not true that the plug to use is the very coldest possible without loading up but rather the opposite. The best *general purpose* plug is the hottest you can get without burning; it will pay off in better idling, starting and economy. This requires the knowledge of the *expertise* known as plug reading, or the judging of the proper range of plug for a given use by the coloring of the porcelain insulator or the condition of the electrodes, depending on the type of plug or the make of plug used.

With the usual American plug the color of the insulator is the clue. In normal street use the plug will "color" at around 100 miles of average driving. If the range is right the porcelain will turn a clear rusty brown or tan. If the range is too hot the insulator will be quite white and possibly lightly speckled. If it is more than a stage too hot it will be chalky white. A plug too cold will be indicated by a sooty black coloring on the insulator and, in some instances, the rim of the shell. A really cold plug will be black and almost wet looking. On some European plugs the porcelain is a pink color and the coloring of this insulator gives a false clue unless the plug is too hot. In this case the insulator takes on a glassy, speckled or blistered appearance and the electrodes will have a yellow or blue tint. When too cold, these plugs get a sooty black deposit on electrodes and shell rim. If right for the engine and use, the color of the electrodes and shell will be an even light gray.

Plug reading can also show up other engine faults as well. The most obvious are loose valve guides or sloppy rings which will show up in a black oily or tarry gum on the shell of the plug. Over-richness will show up as a black deposit on the insulator, much as when too cold a plug is used, but the deposit will be softer and more gray in color if the plug range is right and the mixture wrong. Another fault that will often show on the plugs is too much ignition advance. Assuming you know you have the right range from past practice, too rapid or too much advance, with consequent pre-ignition, will show up in the form of dark speckles on an otherwise properly colored insulator and may even whiten it some due to the improperly tailored spark curve. Naturally all these readings must be taken after a flat-out run either in high gear or one of the higher intermediate gears, and the engine must be cut off clean without



Most commonly used types of electrodes are the exposed ground electrode (left) for street use, the side electrode Champion (center) and the platinum-pointed Lodge (right) used mostly for racing and other high-performance engines.



Gaskets for plugs vary also. The American street plug (left) and the European "O" ring type require care in installation as they require some crushing to effect a proper seal. Solid copper type (right) is used for racing.

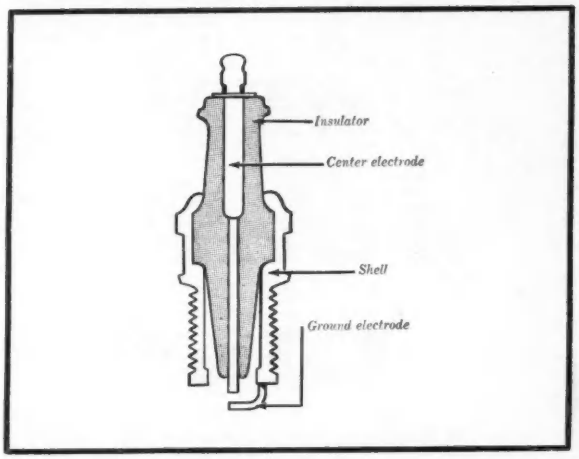
being allowed to shut down with a closed throttle. Immediately on hacking the switch disengage the clutch so that the engine is not turned against compression any longer than it takes to shut itself down. Above all, do not allow it to pull in raw fuel which will tend to wash the plugs clean.

Under competition conditions the plugs will color after a couple of straightaway runs or a couple of laps around the track. Here, the right plug will be a range between the hottest without burning and the coldest without fouling. With straight alcohol the coloring will take longer than with gasoline or alky-nitro mixtures. In all probability, though, the proper plug for gasoline will be the proper one for straight alcohol or possibly one step on the cold side. If, however, nitro is used in small amounts the requirement will be at least two steps colder. In quantities of 15 to 50 per cent the requirement might easily be five to eight plug steps colder. The reason for such radical changes (each single step in heat range indicating 50° Fahrenheit differential in heat transfer) is that the oxygen content of these fuels increases the heat of combustion by 70 to 100 per cent.

As mentioned, this is a rough guide only and carries with it no guarantee. The right plug for any given engine is a matter of experimentation and the above remarks are meant as a guidepost to the start, not as a set of laws. One thing to remember is that spark plug manufacturers have gaps in heat ranges, not all ranges being covered by successive steps. However, these gaps vary and it is advisable to procure a chart of equivalents showing where these gaps are. The chances are that virtually each range is covered by one of the manufacturers, especially in the long-reach sizes.

It sometimes happens, especially with cars set up for long-reach plugs, that there will be problems connected with heat range and hot-spotting even though the recommended range and reach of plug are used. The most common of these is the tendency for an engine to run on after the switch has been cut; *i.e.*, it will "diesel" for a few cycles, even though there is no current to the plugs. This is often accompanied by an apparently unexplainable loss of power at the top end of the rpm scale. This often feels as though the engine has run out of revs that it had before, similar to the effects of low fuel pressure or floating ignition points. The cause is almost assuredly hot-spotting and its companion, pre-ignition. At the higher speeds the plug starts to glow at one point or another and pre-ignites the fuel with the same effect as though the distributor had been cranked back a large number of degrees, and just as if that had happened it shuts things down right now. A colder plug is not always or even not often the answer, particularly if the plug being used is coloring properly.

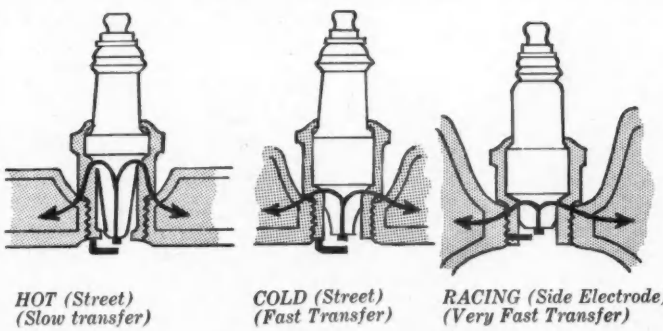
What is in order here is a long and very thorough look at the plug shell and threads. The usual cause of such pre-ignition behavior in an otherwise good plug is that it is protruding into the combustion chamber in such a way that it is in the main path of the flame or that one or more threads with their sharp edges, either on the plug itself or in the head, are exposed. Usually in the case of the street plug it is the threads in the head since virtually all street plugs have an unthreaded section at the end. In this case the cure lies in rounding off the last two or three threads at the combustion chamber end of the plug socket. The more usual cause, though, is the plug itself. In the case of the racing plug the shell is threaded all the way to the end and the last thread in all cases should be carefully edge-broken or rounded with a fine file. In the case of the street-type plug the offender is either sharp corners on the ground electrode or more recently a sharp edge on the shell itself.



Simple as it looks, the spark plug is a complex mixture of rugged components that must survive under severe heat.

The clue to this is a hard carbon deposit on the outer edge of the shell where the evil happenings have occurred. The cure is careful edge-breaking around the outer and inner edges of the shell and the rounding-off slightly of any sharp corners on the ground electrode. In fact this is a wise idea even when installing new plugs if there is the least suspicion that the rim edges are too sharp or the electrode looks too pointy on the corners. Another cure, one that is usually used in conjunction with the above, is the use of a thicker plug gasket, either the solid copper, washer-like gasket supplied for Champion and Lodge racing plugs or the thick O-ring type used with some European plugs. In an emergency two used, compressed standard gaskets will

continued on page 76

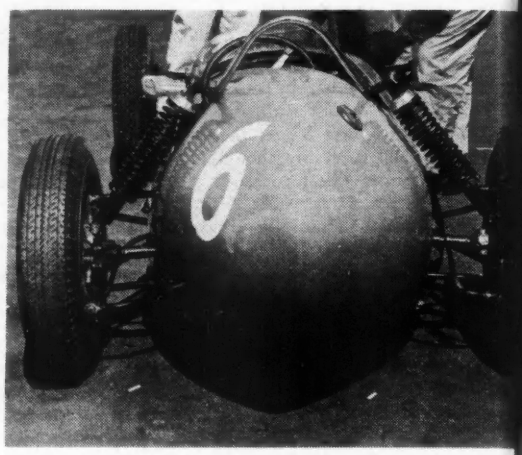


HOT (Street) (Slow transfer) *COLD (Street) (Fast Transfer)* *RACING (Side Electrode) (Very Fast Transfer)*

HEAT TRANSFER THROUGH THREE PLUG TYPES TO WATER JACKET

Shape and mass of ceramic center insulator determines route heat must travel from hot point of plug to dissipating area of cylinder head around the spark plug hole.

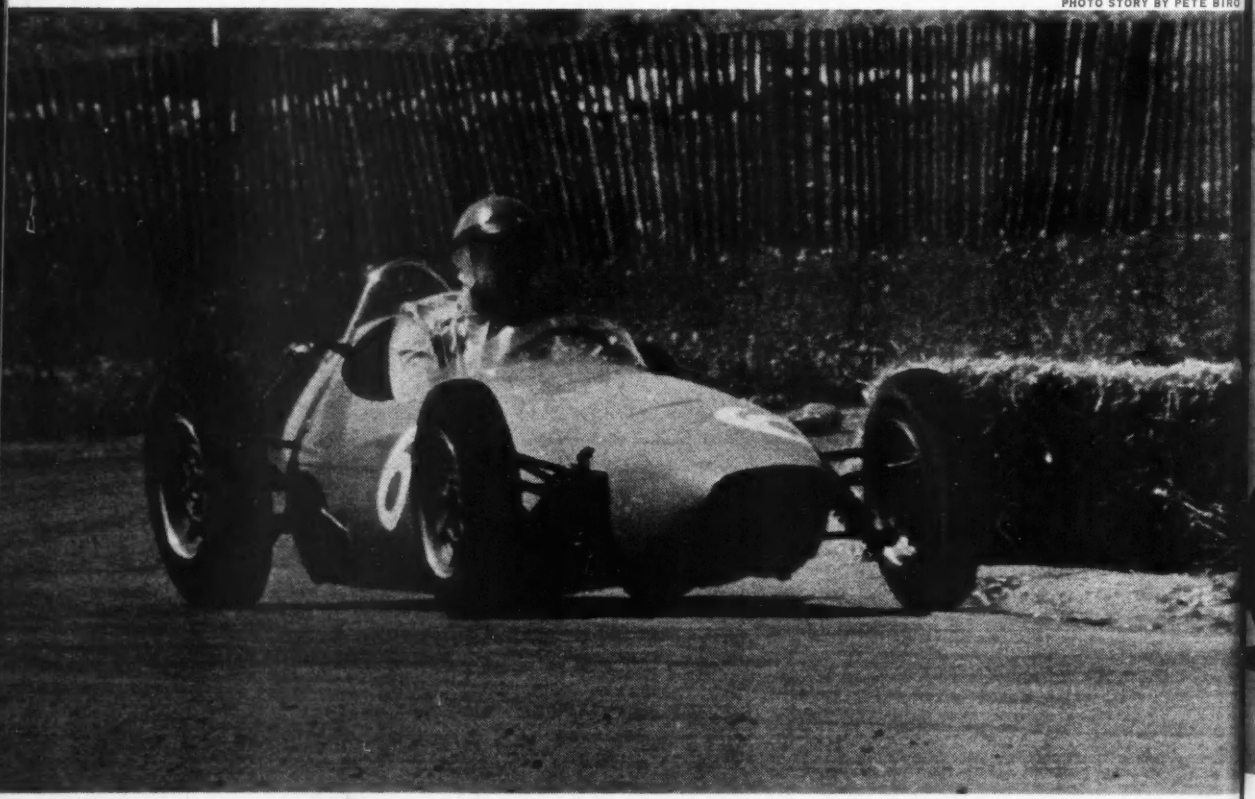
Senior Member of a Junior Clan



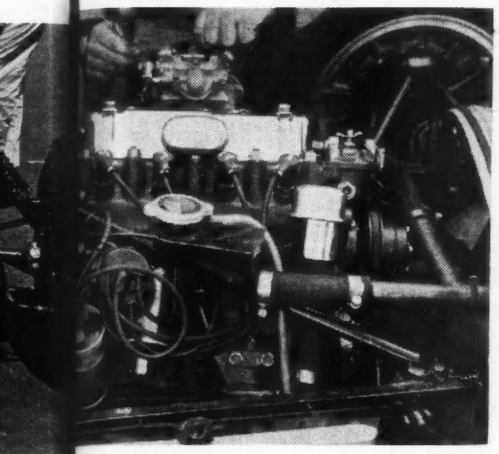
Aluminum bodywork of BMC Junior prototype will be replaced by fiberglass on production versions. The basic structure is a multi-tube frame. Fully independent suspension, front and rear, uses Koni units combining coil springs with shock absorbers.

FIRST-OFF MODEL IN A LINE OF READY-MADE BMC

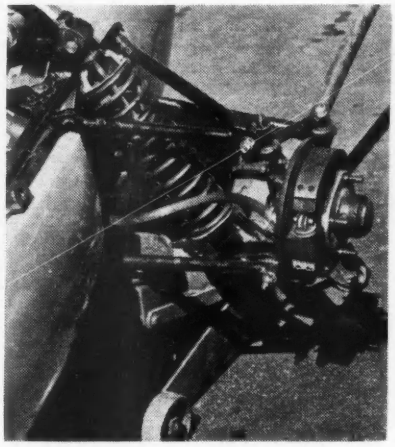
PHOTO STORY BY PETE BIRO



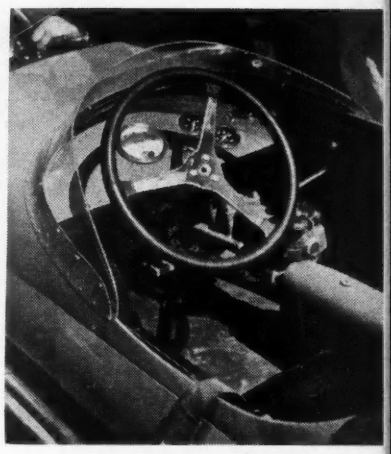
New BMC Junior, built by British Motor Cars of San Francisco, is consistent winner on Northern California race circuits.



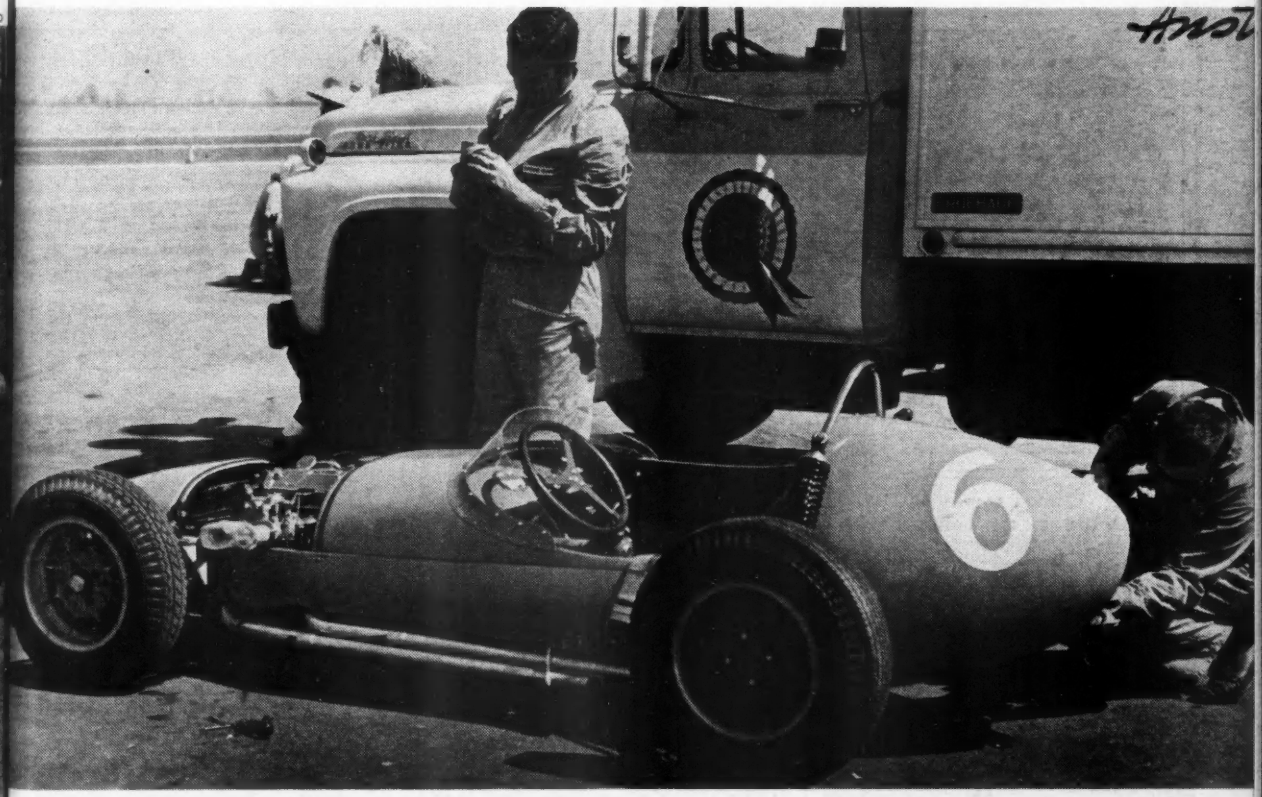
Another BMC, the British Motor Corporation, builds the basic powerplant, a four-cylinder Austin which is modified to produce 75 hp at the BMC Junior's rear wheels. The 998cc unit, fitted with a Weber carburetor, mounts at an angle to allow a low hood and offset driveshaft.



A close-ratio gearbox is also Austin. Brakes and steering are Sprite and the brake drums are cast integrally with alloy wheels. Priced at $3995, the BMC Junior is scheduled for an initial production of 10 by British Motor Cars, 1800 Van Ness Avenue, San Francisco, Calif.



FORMULA JUNIORS PROVES A WINNING DESIGN



Designer Joe Huffaker checks plugs as he prepares BMC for its first race and first victory, an event at Stockton, Calif.

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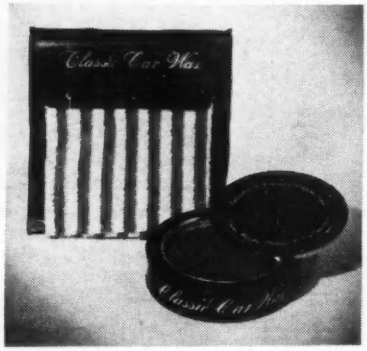
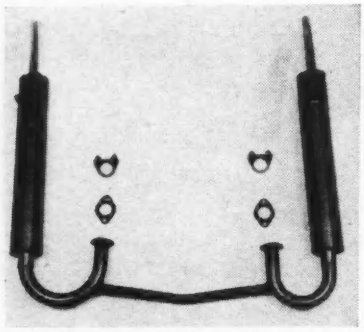


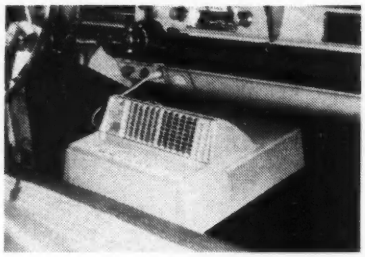
just rub it on, then dust it off—will produce a hard jewel-like custom finish. A $3.50 kit contains ½-pound can, applicator cloth and handy plastic storage case. Available from Jay's Sports Car Accessories, 6055½ Melrose Ave., Dept. MP, Hollywood 38, Calif.

DUAL EXHAUSTS FOR THE CORVAIR fulfill their promise of increased road horse-



power through reduced back pressure. This DS-560 assembly by Douglass raised output rating from 47 hp at 2950 rpm to 54 hp at 3100 rpm (readings taken at rear wheels in second gear). The quickly installed set includes matched mufflers (choice of glass or steel pack), attached chrome tips and welded mounting brackets, clamps and gaskets. Listing at $34, the assembly is offered by Douglass Muffler Mfg. Co., 5636 Shull St., Bell Gardens, Calif.

A PORTABLE AUTO AIR COOLER that can also be used in a roadside motel or at home offers a unique comfort combination. And when it also contains an ice cube compartment for beverages or perishable foods, it would seem to be a must for warm-weather travel. Just plug it into your car's cigarette lighter or into the 110-volt AC transformer for home use. The Wright evaporative cooler holds three gallons of water for a four-hour operating capacity. A foot high, by about 1½ feet square, the rustproof plastic cabinet has directional airflow grilles, large filter pad, water level indicator and two-speed motor.

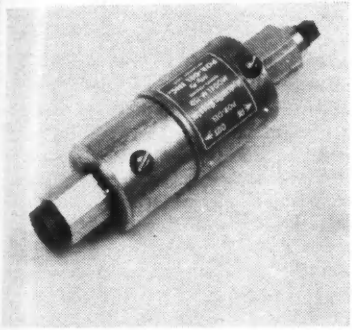


Unit comes in six- and 12-volt models, weighs only 21 pounds. The maker is Wright Mfg. Co., 2902 W. Thomas Rd., Phoenix, Ariz. Price: $54.95.

"DRESS DRIVER" GLOVES feature a seamless palm design to provide more comfort, a sure grip and longer wear. The tailored wrist and close finger-fit complement the freedom of movement that the supple deerskin leather offers. Men's and ladies' sizes are available. (If not sure of size, trace your hand outline.)

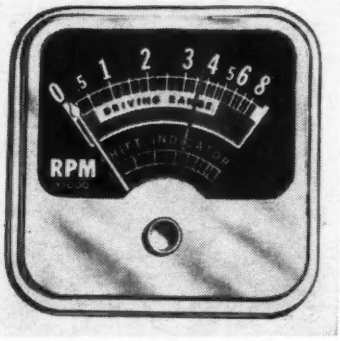
Dress Drivers may be ordered for $4.95 postpaid from Thurlow Glove Co., 100 N.E. Union Ave., Portland 14, Ore.

SHORTER STOPPING DISTANCE with less pedal effort is promised by the Por-Del hydraulic brake booster. Not dependent on outside power supply or vacuum, the unit works equally well in high or low



altitudes, with engine running or dead. The six-inch-long, two-pound accessory can be mounted directly on the master cylinder or at any convenient location. For easier and safer braking with this simple booster unit ($24.95), contact the nearest Por-Del dealer, or write direct to distributor: Dealer Enterprises, 9052 W. Pico Blvd., Los Angeles 35.

TRANSISTOR TACHOMETER with shift-point indicator finger (adjustable by knob on the tach face) indicates the precise moment to shift gears—for up to 15 per cent faster acceleration and lower elapsed time. Double-color-coded scale reads to 8000 rpm, and gives correct driving ranges for full power or maximum economy. Completely assembled, chrome-

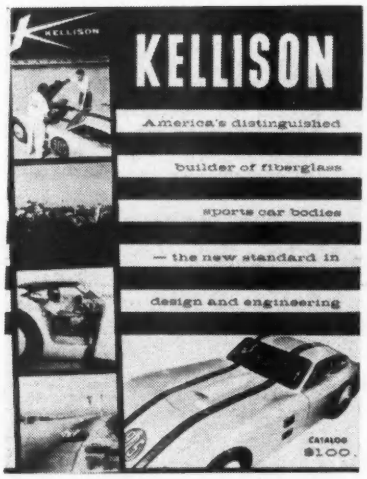


faced tach is guaranteed, priced at $19.95 from Almquist Engineering Co., PR-91, Milford, Pa.

GORDON HAND TOOL SETS—of drop-forged heat-treated, chrome-vanadium steel—are a must for the professional mechanic, or even a tinkerer with pride. The set of five open-end ignition wrenches offers a range of 10 B. A. sizes ($3.75). Of special interest to motorcyclists is the combination set of three wrenches (⅛ to 5/16-inch), two screwdrivers, and midget slip-joint plier with slim beak head ($7.95). Both sets come in handy carrying cases. For

further information on these and other high-quality tools, write to Webco, 218 Main St., Venice, Calif.

FIBERGLASS SPORTSCAR BODIES, to fit wheelbases from 80 to 102 inches, are described in Kellison Engineering's new 24-page illustrated catalog. A special section is devoted to the parts and ac-



cessories needed for building an individualized design. Catalog charge of $1 is refunded with first order. Write to Kellison Engineering and Mfg. Co., Dept. MT-8, Folsom, Calif.

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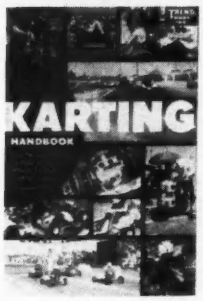

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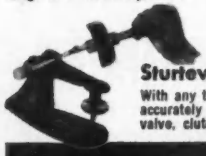

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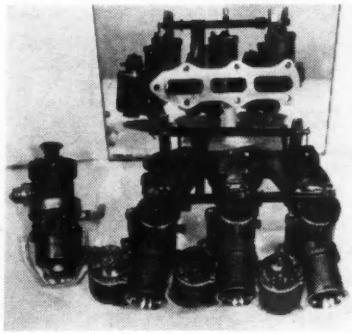

or those who plan to use this increasingly popular powerplant for Formula Junior racing cars will be interested in the triple-carburetor manifold now available.

The super racing kit has three Amal GP 1⅜-inch carbs with float bowls and linkage, sells for $450; with Amal TT carbs, $350; and with Monoblocs, $250. Each kit includes new heavy-duty Stewart-Warner fuel pump. For full details contact James Motor Center, 1350 Long Beach Blvd., Long Beach, Calif.

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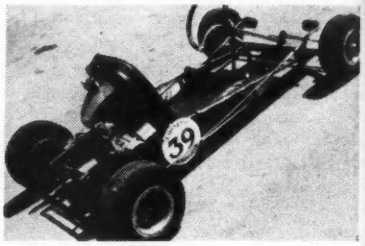

pounds with Homelite engine and sells for $395. Charcon, Inc., 7137 Laurel Canyon Blvd., North Hollywood, Calif.

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and improved braking traction on slippery surfaces. An extensive testing program under all road and weather conditions has gone into development of the new tread, now being offered in the Flying A premium tire line. Shown above with one of the new tires is J. Ronald Getty, Marketing Manager of Tidewater Oil Co.

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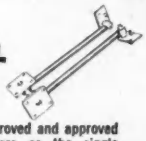

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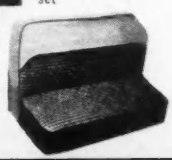

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Hi-ball on the highway in free-wheeling 2 w.d. with Warn Hubs on your 4 w.d.—no front end drag or whine, better gas mileage, easier steering. Save money, save road time. Switch in seconds into 4 w.d. when the going gets rough! Change to 2 or 4 w.d. automatically with Warn Lock-O-Matics, manually with Warn Locking Hubs. Guaranteed. Models for all makes 4 w.d.s to 1½ tons. At your dealer's or write: **WARN MFG. CO.** Riverton Box 6054-F, Seattle 88, Wash.

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KEEPS CAR COOLING SYSTEMS CRYSTAL CLEAR FOR AN ENTIRE YEAR

At Service Stations Everywhere

Unlucky for rust!

KONI

ADJUSTABLE SHOCK ABSORBERS
20,000 MILE GUARANTEE

- Every KONI is performance tested
- Adjusts up to double damping
- Double acting, bump and rebound
- Specially designed for each car
- Fit domestic and foreign cars
- Standard on Porsche, Ferrari
- Increased comfort & safety

For details, list of dealers, write:
KENSINGTON PRODUCTS CORP.
P.O. Box 77, Lenox Hill Station, New York 21
Phone: JUdson 2-9343

Full line of garage lifts available.

WANTED!

Mechanically Inclined Men to Qualify for

BIG PAY JOBS

AND SPECIAL FACTORY TRAINING IN DIESEL

"We need qualified repairmen, operators, mechanics NOW!", say Diesel Manufacturers. Highway Builders, Truck Line Operators in every corner of America. Can *you* qualify for these High Pay Jobs? We can help you! Interstate's General Course and Cummins-approved Diesel home-training courses are internationally recognized. Advisory placement service for trainees. Don't wait. Men are needed NOW!

Get the Facts Today!

WRITE INTERSTATE TRAINING SERVICE
Dept. A-29, Portland 12, Oregon

Rush information on I.T.S. Diesel Courses, Special Factory Training and Diesel Job Opportunities.

Name_____

Address_____

City_____ Zone____ State_____

VALIANT CUSTOM KIT

Customized Compacts

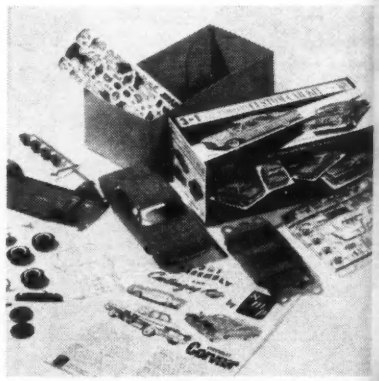
FOR THE GROWING NUMBER of compact car owners in this country, the AMT Corp. has packaged complete customizing model kits. The big advantage of these kits is that the owner can try several designs and see exactly how his car would look customized—before making a big investment in labor and materials.

The designs are based on ideas submitted by the editors of MOTOR TREND, who felt that no extensive sheet metal or body modifications should be included. Pictured here are the kits for Corvair and Valiant. Introduced last month were kits for the Comet and Falcon. The models are scaled to 1/25 original size.

Model builders, or those who want to see how their own compact car would look when customized, will be able to build many different designs. The 3-in-1 kits have enough parts to build either a stock model, a stock racing version or an individually styled custom.

The Corvair kit (pictured below) has been lowered three inches, features a reworked front end design, tubular bar grille with nerf bars, fender skirts, special hubcaps, an optional dorsal-type tail fin and several striping decals. The racing model, included in the same kit, has blacked out headlights, numeral decals, bracing and is modeled after the Corvairs that competed at Daytona.

The other kits—Valiant, Falcon and Comet — are also 3-in-1 models with plenty of extra parts which will give the ingenious customizer plenty of material with which to try out his own ideas.



CORVAIR CUSTOM KIT

BUY Direct by Mail and... SAVE MORE on All ACCESSORIES and PARTS in the World's Largest Automotive Dept., Store — J.C. WHITNEY & CO.

"Stop Car Thieves" with this Auto Burglar Alarm

Let this private police-man protect your car 24 hours a day—completely automatic — blows horn intermittently if car is molested. Resets itself automatically. Easy to install.

Here's the only all-out protection against battery, tire, gasoline, and auto thieves. Alarm installs under car hood and automatically arms when car horn intermittently the instant anyone touches any part of the car—and continues to blow if for approximately 15 seconds the car is left unmolested. Simply set switch and attempts to dash upon leaving car. Upon contact, alarm scares thief away. With complete instructions for simple, quick installation.

No. 17—Each ..... POSTPAID **$2.50**

ADD NEW GYROSCOPE STABILIZERS, IT'S LIKE A SET OF TIRES FREE

for every car you drive for the rest of your driving life.

Like a giant gyroscope in your wheel.

Gyroscopic Stabilizers Give the Driving Ease of Power Steering—Even If You Don't Have Power Steering.

- Makes light cars hold the road like heavy cars even in high winds.
- Reduces skidding and shifting.
- Use most gyroscopic action.
- Can't wear out or break down—never needs repairs or servicing.
- Can be changed from car to car—fits any American car and most foreign cars, regardless of year, make or model.
- Will keep your wheels perfectly balanced for the life of your car.

Gyroscopic Stabilizers Check These Front-End Troubles Before They Start—Add Thousands of Miles to the Life of Your Tires

Smoothes out the bumps—cuts wear and tear on vital front end parts—keeps steering assembly tight—makes your car hug the road like a custom-built racing car. You get thousands of EXTRA miles out of your rubber—up to double the life of your tires—makes your ride SAFER, SMOOTHER, SURER—all the way!

No Other Auto Accessory Like It

Will Gyroscopic Stabilizers work for you as they have for others? They must work. It is impossible for them not to work. Because the gyroscopic principle is just a man-made law, but a natural law of the universe. Just as the law of gravity keeps you from falling off the earth, the law of gyroscopic action keeps the earth from plunging into space—keeps the planets on course in their orbits. And it is this same natural law that you can expand on to keep your car stabilized each and every minute you drive for as long as you'll ever drive. Remember, Gyroscopic Stabilizers are guaranteed to give you satisfaction or your money back.

When ordering, be sure to specify make, year and model of car, and tire size.

No. 475 —Per Set **$19.95**

Gyroscopic Stabilizers Can Be Installed By You In Minutes Using Only Your Lug Wrench

Why Gyroscopic Stabilizers Can Add Up to 10,000-20,000 EXTRA MILES to the Life of Your Tires

AUTOMATICALLY balances your wheels perfectly and permanently; helps keep wheels in alignment; saves excess wear and tear on tires—helps you get up to DOUBLE THE LIFE out of your tires.

AUTOMATICALLY helps prevent loosening of front-end parts . . . keeps steering assembly safe and tight . . . makes your car hug straight and true even if you have a blow-out at high speed.

AUTOMATICALLY "irons out" the bumps; takes the weave and wander out of car tracks, ruts, ridges, etc.—makes even a rough, "washboard" road seem smooth and level.

AUTOMATICALLY gives you fingertip control at all speeds, on sharpest turn or straight-away—makes your grip the highway like a $10,000 sports car.

DUAL MUFFLER EQUALIZED EXHAUST SYSTEM for 1960 CORVAIR

Complete with 2 Steel Packed Sports Car Mufflers.

Makes a real sports car of the '60 Corvair.

- Reduces Back Pressure.
- Increases Gas Mileage.
- Increases Horsepower.
- Increases Top Speed.
- Easily installed in approx.. 15 minutes—nothing else to buy.

The simplest, easiest and most economical way to improve the all-around performance of the '60 Corvair is to install this dual muffler and equalized exhaust system. Eliminates back pressure and congestion of crossover pipe and stock mufflers—allows exhaust gases to flow freely and let the engine deliver its top power, its top economy. Easy to install—just remove old muffler and pipe—install the dual muffler exhaust system. Takes only minutes and you're ready to enjoy that sports car performance from your '60 Corvair engine. Kit contains 2 steel packed sports car mufflers with hangers attached, 1 dual equalized exhaust system, 2 curved extensions welded to mufflers, all necessary hangers, brackets and instructions.

No. 688 —Per Kit **$23.95**

Sleek—Wide—Massive—Impressive STAINLESS STEEL Tubular Type Custom Grilles

For FORD, CHEVROLET & THUNDERBIRD

Deluxe quality—heavier ¾" diameter, 18 gauge heavy stainless steel tubing. Tubes used in these grilles are not solid, but 2/3 of a full tube, and are open in back. Brackets have welded studs that match original grille mounting holes. No alterations required. New parking light housing supplied when necessary for installing lights behind grille (except 55-56 Chev. & Ford).

A. 1955 FORD (Parking light to parking light)
B. 1953 FORD (Fender to fender)
C. 1954 FORD (Parking light to parking light)
D. 55-56 FORD (Fender to fender)
E. 1957 FORD (Fender to fender)
F. 1958 FORD & T-BIRD (Fender to fender)
G. 1959 FORD (Fender to fender)
H. 1955 CHEVROLET (Fender to fender)
I. 1956 CHEVROLET (Fender to fender)
J. 1957 CHEVROLET (Fender to fender)
K. 1958 CHEVROLET (Fender to fender)
L. 1959 CHEVROLET (Fender to fender)

SWEEP ALL THE WAY ACROSS GRILLE OPENING FOR INDIVIDUALIZED FRONT END SPLENDOR

Regular $39.95 Value!

No. 13— Each **$16.95**

12 Brand New Car Plaques

New Eye Catching Design—For the Individual —For Clubs.

No. 529 C — No. 529 D — No. 529 H — No. 529 K — No. 529 M — No. 529 N — No. 529 O — No. 529 P — No. 529 R — No. 529 S — No. 529 U — No. 529 T

Ground raised letters & design. Paint baked on and bonderized. Leatherette-like backgrounds. Rustproof—Easy to mount. Heavy cast aluminum. Large size 5" x 9".

All Nos. Each **$2.98**

BOOKS THAT TELL AND SHOW YOU HOW—

To Fix: Your Ford— Your Chevrolet— Your Plymouth—

FIX YOUR CHEVROLET HAND BOOK
For all models 1940 thru 1957. 232 pages of instructions and illustrations.
No. 139—Each—POSTPAID $3.95

FIX YOUR PLYMOUTH HAND BOOK
For all models 1946 thru 1957. 224 pages of instructions and illustrations.
No. 118—Each—POSTPAID $2.95

FIX YOUR FORD HAND BOOK
For all models 1932 thru 1957. 224 pages of instructions and illustrations.
No. 119—Each—POSTPAID **$2.95**

Ford Model "A" Service Manual
All repair information on model A's.
No. 276—Each—POSTPAID **$1.00**

Renault (Dauphine) Owner's Hand Book. For repair and maintenance. Over 185 pages with 150 illustrations.
No. 32—Each. POSTPAID **$3.00**

Volkswagen Owner's Hand Book. Over 144 pages with 150 illustrations on care and servicing of VW.
No. 918—Each. POSTPAID **$2.00**

Vauxhall Maintenance & Repair Book. For all models from 1933 thru 1958. 241 pages, over 100 illustrations.
No. 926—Each. POSTPAID **$2.25**

English Ford Maintenance & Repair Book. For all models from 1934 thru 1958. 240 pages, over 133 photos & drawings.
No. 927—Each. POSTPAID **$2.25**

Chevrolet Speed Manual. How to speed tune Chev. and GMC engines. Complete how-to-do-it information. 128 pages.
No. 360—Each POSTPAID **$2.00**

Model A&T Ford Owner's Hand Book. Contains 576 pages of information and instructions on operation and maintenance of both "T" and "A" models.
No. 361—Each. POSTPAID **$6.00**

PAY LESS THAN EVER for a Star Fire CAP SPINNER

Simplifies the Car the Easy Way. Dresses up the hub cap. Gives your car that custom look. Heavily chrome plated on stamped steel. Easily installed—no special tools needed. Can be left on all hub caps.

No. 853—Each ..... Postpaid **$1.79**

NEW SHOCK OVERLOAD SPRINGS

Installs Over Present Good Shock Absorbers.

Shock springs carry heavier overloads with a level ride—no bottoming.

UP TO 2000 LBS. ADDITIONAL LOAD CARRYING CAPACITY.

Easy to install—anyone can install in minutes. No special tools required. Slips right over worn shock absorbers. No more sag and no more bottoming. Fits almost all makes and models. Increase road clearance.*

*Do not use on airplane type shock absorbers. Specify make, year and model of car when ordering.

No. 116—Per Pair **$6.95**

GLEAMING CHROME GENERATOR COVERS

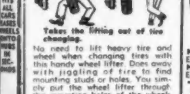
For all Late Model Step-Down Generators.

- Dresses up Generator — adds gleaming chrome.
- Easily installed.

Fits late model generators the easy way—over the new 2 piece chrome generator covers to add a sparkling finishing touch to your engine. Covers the entire generator, main case and arm drawn sections. Beautifully chrome plated over heavy gauge steel—won't discolor nor rust. For the following cars:

No. 448 A —For 53-60 Chevrolet, Pontiac
No. 6420 B —For 53-60 Buick, Cadillac, Olds
Complete 2 piece set. ..... POSTPAID **$3.00**

WHEEL LIFTER

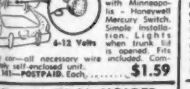


Takes the fitting out of tire changing.

No need to lift heavy tire and wheel when changing tires with this handy wheel lifter. Does away with jiggling of tire to find mounting studs or holes. You simply put the wheel lifter through the mounting holes of the wheel, and place prongs of lifter onto lugs of drum. Then just lift the rounded handle and the wheel is raised and guided to fit the drum perfectly. Lifter adjusts to all size widths of lugs and bolt holes. POSTPAID **$1.50**

No. 374 —Each

AUTOMATIC TRUNK LIGHT



6-12 Volts

Completely automatic operation. Equipped with Minneapolis Honeywell Mercury Switch. Simple installation. Lights when trunk lid is opened. Fits any car—all necessary wire included. Complete, self-enclosed unit.

No. 181—POSTPAID. Each **$1.59**

TRUNK TOOL HOLDER

FITS ALL TIRES!

Fits over the spare tire in trunk. Simple to install. Compartment for storing tire, shoes, flashlight and other car needs. Eliminates trunk rattle. Made of durable leatherette, sewed with nylon thread.

No. 759—Each—POSTPAID **$1.98**

ADD NEW GYROSCOPE STABILIZERS, IT'S LIKE A SET OF TIRES FREE

(duplicate)

Sensational Discovery Chrome-Like Finish

Refinishes Rusted, Pealed or Worn Off Chrome to Match the Original Brilliance.

a An Amazing New Do-It-Yourself Process.
a Gives A Reflective Chrome-Like Finish.

With this new finishing process rusted, pealed or worn chrome can be refinished to a brilliant lustre to match the original finish. No need to have shabby chrome on the car or spend a large amount of money to have parts rechromed. With Chrome-Like Finish these parts can be refinished to their original lustre. Not a paint-on or a cleaner. Each kit contains all the necessary material and easy to follow instructions.

No. 186—POSTPAID. Kit **$4.95**

Spiral Hubcap Decal

Add new, original, custom styling to your car with these hypnotic spiral hubcap decals. Printed in silver and black, spiral design catches every eye when wheels start rolling. Also included are two 2¼" decals with red and two separate rusts on each sheet. Decal is 7½" in diameter, bolts are 3 long, nuts are 1⅛" wide. Can be easily applied to any smooth finished hubcover—after it has been thoroughly cleaned and dried. Decals will not chip, peel or fade. Specially treated to adhere to chrome finishes.

No. 363 —Set of 2 ..... POSTPAID ..$1.75
No. 363 —Set of 4 ..... POSTPAID ..$3.00

MELLOW TONE Fiber Glass Packed MUFFLERS

Custom designed and engineered to fit each make and model of car—no alterations necessary.

Increases horsepower, increases gas mileage, straight-thru construction, no back pressure, no baffle gimmicks, deep powerful tone—non-offensive tones. Be sure to Specify Make of Car, Exact Year & Model, Type of Transmission, Size of Dual Exhaust.

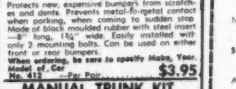
No. 37—Each **$4.95**

HI-SPEED ELECTRIC SIREN

Developed especially for the U. S. Navy & Coast Guard. Now used by hundreds of Fire & police departments, buses, ambulances, etc. Complete with bracket, screws, 10 ft. of cable & push button. Green Enamel.

No. 71—6 Volt
Each ..... POSTPAID **$13.39**
No. 91—12 Volt
Each ..... POSTPAID **$16.49**

RUBBER BUMPER GUARDS for All Cars

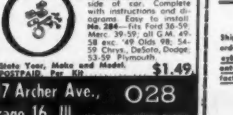


Protects new, expensive bumpers from scratches and dents. Prevents metal-to-metal contact when parking, when coming to sudden stop. Made of black moulded rubber with steel insert —8" long, 1¾" wide. Easily installed with only 2 mounting bolts. Can be used on either front or rear bumpers.

When ordering, be sure to specify Make, Year, Model of Car.

No. 412 —Per Pair **$3.95**

MANUAL TRUNK KIT



Streamlines rear deck lid. Remove present handle, operate from inside of car. Complete with instructions and diagrams. Easy to install.

No. 286—Fits Ford 36-59; Merc. 39-59; all G.M. 58 exc. '49 Olds 98; 54-59 Chevs., DeSoto, Dodge 53-59 Plymouth.

State Year, Make and Model.

POSTPAID. Per Kit **$1.49**

WINKING CAT

- Large, Life-Like White Furry Cat.
- RED EYES LIGHT UP OR BLINK.
- Sits On Rear Window Ledge Blinks At Passing Cars.

Novel, life-like large white furry cat, 19" long, 6" high. Sits on rear window ledge—red eyes light up when brakes are applied, blink on and off when direction-indicators are used. Necessary wire supplied for easy installation. For both 6 and 12 volt systems.

No. 913—Each **$6.95**

AUTO FABRIC SPRAY

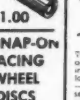
For a new looking car interior. Brightens and freshens faded and soiled fabrics. 12 oz. pressurized can for use on headliner, door panels, and floor covering. Does not rub or flake off. Use to tint upholstery. Choice of red, rust, brown, tan, dark and light green, dark and light blue, dark and light gray, yellow, maroon, rose or black and white.

Specify color when ordering.

No. 56—POSTPAID **$2.95**

Chrome Door Lock Knobs

TRIPLE CHROME PLATED



Changes colored door lock knobs to all chrome. Customizes interior of car and brightens inside of doors.

Specify Car & Year.

No. 372—POSTPAID ..... 2 FOR **$1.00**

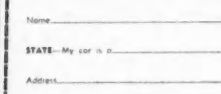
Spun Aluminum SNAP-ON RACING WHEEL DISCS

NOTE: The SNAP-ON fingers hold disc to wheel securely. Rest for easy installing and removal.

Designed for beauty—engineered for speed. These new spun aluminum racing wheel discs will add new splendor to any car. Engineered with gentle serrations, deep powerful tone—non-offensive tones. Be sure to Specify Make of Car, Exact Year & Model, Type of Transmission, Size of Dual Exhaust.

No. 37—Each **$4.95**

"Hollywood" Wolf Whistle



Intake manifold whistle gives the wolf call, imitates a barking dog and other effects. Simple to install—works off the intake manifold.

No. 61—POSTPAID. Each **$2.95**

"WIND-UP" SPORTS CAR KEY

Here is a laugh-getting gadget everyone will enjoy. Oversize (14" wide x 7½" high) wind-up-type key can be attached anywhere—on the back of your small foreign or sports car, on the door of your bathroom, on the trunk deck of any car, etc. It will create comment and bring a smile wherever it is seen. Made of high impact plastic and has a rubber suction cup. Will stick tightly on any clean surface by just wetting suction cup before applying.

No. 490 Each ..... Postpaid **$1.49**

Color Dye for Lamp Bulbs

Customize Your Car With Colored Instrument Lights.

This is a permanent transparent dye that will adhere to lamp bulbs. Not a cellophane coating. Use on dash lights, dome lights, safety lanterns and radio panel lights. Simple to use —applicator furnished—one bottle will color six-eyed bulbs. Available in RED, GREEN, BLUE and VIOLET. State color wanted when ordering.

No. 745— Each **$1.00**

CAST IRON EXHAUST CUT-OUT

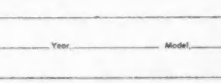
For All Cars with Exhaust Pipes 1¼" to 2¼"

Exhaust tone is controlled from the dash. Can be used as a cut-out in the country and closed in restricted areas. Can also be used to operate two different toned mufflers. Sturdy cast iron construction. Easily installed.

No. 613 Each **$3.75**

For all makes of Cars.

WHEN YOU WANT PLENTY OF NOISE—INSTALL A HOLLYWOOD NOISE MAKER MUFFLER



- Shell length only 11 inches long.
- Overall length 18 inches.
- Diameter 5".

THE MUFFLER WITH THE LOUDEST R-O-A-R!

- Straight-thru construction with perforated inner core. No Pinch—No Baffles.
- All Steel Construction with electrically welded seams.
- Universal end caps with bushings make this muffler adaptable to any size tailpipe.
- Complete with clamps and bolts.

No. 361—Each **$3.98**

SAVE 24% During This TREMENDOUS SALE

Was $8.95—Now $4.95!

MILEAGE METER

Most important instrument on the Car's Dash Board. Beautiful 4 Color Dial.

Mileage Meter's exclusive "relative" miles per gallon scale shows how to get the most mileage for your car. Develops pay for itself in gas savings alone. Mileage Meter's engine condition scale warns when adjustments are needed to avoid costly break-downs and repairs. Eliminates guessing. Reports continually on over-all conditions of the engine. Mileage Meter's vacuum scale and "Dashboard Manual" provide all the information needed for engine tuning to the point of efficiency. Easy adjustments are really simplified. Easy to install on any car. No holes to drill.

No. 162 —Standard 2⅝" Diameter. Plated Trim. each..... **$4.95**

USE THIS HANDY ORDER FORM — MAIL TODAY!

J.C. WHITNEY & CO.
1917 (028) Archer Ave., Chicago 16, Ill.

I enclose Check or Money Order $..... to cover payment in full. Please do not send currency or stamps. We pay postage on items marked POSTPAID when full payment accompanies order, you pay shipping charges on items not marked POSTPAID. Minimum C.O.D. order accepted must be $5.00 or more—enclose at least 25% deposit, pay balance plus all shipping charges upon delivery.

Name.....

STATE—My car is a..... Year..... Model..... No. of Cyl.....

Address.....

City..... Zone..... State.....

☐ Catalog sent Free with your order. Check here if you want Catalog only—Send 25¢.

Quantity	Stock No.	Description	Price

Ship following order on money-refund guarantee of satisfaction.

FREE!

NEW 388-PAGE CATALOG JAM-PACKED WITH VALUES

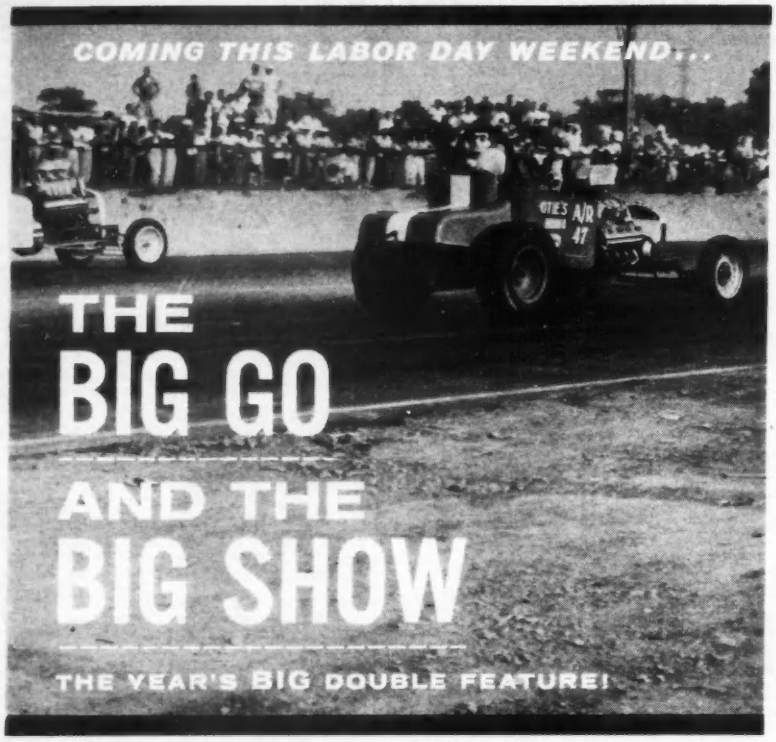
NEW LOW PRICES

THOUSANDS OF NEW ITEMS

1960 EDITION JUST OUT!

This giant 388-page catalog, packed with over 100,000 items for the automotive, truck, car, hot rod and custom car owner . . . is yours FREE with any order for items selected from this advertisement. If you just want the catalog, send only 25¢ to cover part of handling and mailing cost (refunded on your first order).

J.C. WHITNEY & CO. 1917 Archer Ave., Chicago 16, Ill. 028 USE HANDY ORDER BLANK



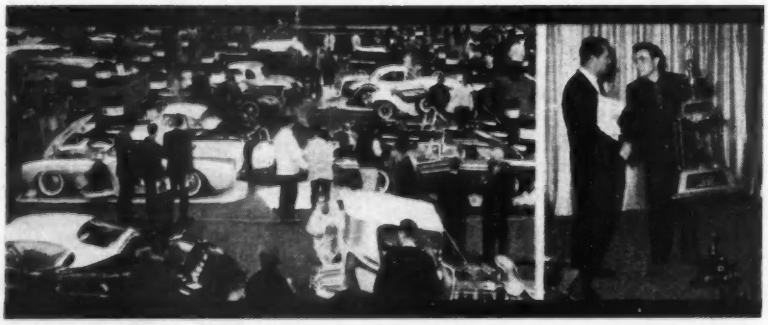
DETROIT DRAGWAY—SEPTEMBER 1, 2, 3, 4 & 5

6 *th annual*
NATIONAL CHAMPIONSHIP DRAG RACES
5 DAYS AND THREE NIGHTS OF THE BEST IN DRAG RACING

DETROIT ARTILLERY ARMORY—SEPTEMBER 2, 3, 4 & 5

2 *nd annual*
NATIONAL CHAMPION CUSTOM CAR SHOW
FEATURING THE TOPS IN WAY-OUT CUSTOM CREATIONS

PRESENTED BY THE NATIONAL HOT ROD ASSOCIATION



FOUR BRAND NEW FORD CARS will be awarded to winners in this double-bill extravaganza, plus thousands of dollars worth of valuable merchandise and trophies.

DON'T MISS IT...THE BIGGEST AND BEST OF THEM ALL!

For information on entries, write to BIG GO or BIG SHOW c/o NHRA, 1171 North Vermont Ave., Los Angeles 29, Calif.

Entry deadline, both events, is August 1, 1960.

The Alpine

continued from page 39

banger. Fuel comes in through a pair of down-draft Zeniths and exhaust gases are permitted a smooth escape through a four-branch system which blends into two pipes.

The unit-construction body is suspended at the front by Rapier unequal-length A-arms, coil springs, tubular shocks and an anti-roll bar; at the rear is a conventional live axle with semi-elliptic springs and lever shocks.

Braking is potent and offers a built-in solution to the too-small drums often installed on 13-inch wheels. Girling disc brakes at front, 9½ inches in diameter, combined with nine-inch drums on the rear, provide fade-free stopping.

Let's try the car. Hop in. No contortions required; wide doors fit all sizes. Twist the key—turn starter and the crisp exhaust note is immediately on tap. Settle down in the seat and push the four-speed box into first gear. Good news for the size 12 triple E's—pedals are widely and equally spaced. Also, the non-adjustable wheel suited varying sizes of our test drivers. Take off and let it out through the gears; 5500 revs, where the yellow warning band begins, is a safe limit. There is a considerable gap between first and second but the ratios get comfortably closer on the way to fourth.

Let's ease back now and thread through some heavy traffic. Pulling power at low revs in fourth is OK although shifts to third are indicated for added punch. Final drive as we tested with the standard axle is 3.89 to 1; with the optional overdrive 3.389 is the highest cog. Recirculating ball steering is light—it feels a trifle on the slow side at three turns lock-to-lock in relation to other sportscars, but it's nothing one can't get used to. Visibility front and rear with either top is fine; lane changing and parking clearances may be judged accurately and without difficulty.

Off to the open road where we can let things out along the straight and move around some high-speed bends. Over an uneven, rock-strewn detour the riding qualities checked out to our satisfaction. Softer than on comparable sportscars, the suspension will not bottom except under extreme provocation. There is no mushy wallow nor does every little surface irregularity pound the passengers. Move on up to an indicated 90 mph (a true 80 on the test car) and the Alpine is extremely quiet. Wind noise is low, as is engine level. No squeaks and rattles; it has that secure solid feel that breeds confidence in a machine. With overdrive, 100 mph can be reached at 5780 rpm but calculations indicate that with the conventional ratio it takes 6300 revs to reach the speed and that's too high for safe operation, even if it could be attained in fourth which seems unlikely.

High-speed handling is good but not extraordinary. It behaves pretty much as expected, with a desirable built-in understeer. But we weren't testing it as potential competition material. Some severe crosswinds passed by with no discernible effect. We were prepared to make adverse comment on handling because of the 13-inch wheels. They were utilized to lower the body but their effect on performance is negligible.

After a few miles one begins to sort out the full complement of instruments and controls. Big tach and speedo are visible through the wheel with the usual assorted auxiliary instruments scattered left, right and center. We liked the idea of calibrating the speedo both in miles and kilometers per hour. Especially useful is a gas gauge that reads directly in liters or gallons up to the tank's nine-gallon capacity. Just under the padded roll at the top edge of the dash are heating and vent controls for a system ample to warm up the interior. Of course, weatherproofing is so good there are no drafts to fight. Dash compartment stowage is open; a door would be nice but there is a lockable lid over the space in the center armrest. (It is hardly fair to call it an armrest because it's too low for comfort.) Placing the hand brake along the left side of the driver's seat is unfortunate. We have seen bruised thighs and torn trousers as a result.

Fuel economy after 500 varied and quite hard miles ranged from 16 mpg around the city to 24.2 where steady running was the rule. It must be emphasized without apologies that this is the bottom of the scale. The even slightly frugal driver can easily better these figures.

We doubt that the Alpine will win many trophies on the dragstrip. Our time for the standing quarter-mile with two aboard averaged a flat 65 mph and 20.6 seconds. While perfectly adequate to keep up with and ahead of traffic, it is not sensational. To be frank, the car feels a good deal livelier than the figures indicate.

We liked the accessibility of all the vitals in the engine room. Master cylinders, spark plugs, distributor, coil and, amazingly, the oil filter are right where they should be—convenient for professional mechanics, home tinkerers and those owners who never turn a wrench but like to wipe off the dust on Sundays. The polished aluminum rocker cover is a handsome dressy touch. Exceptionally low hood line is possible with cross-flow radiator.

Public acceptance is the real answer to whether a car is good or bad. Alpines are selling as fast as they can be unloaded from the ships and made ready. Dealers just can't get enough cars. A spokesman for Rootes indicated that their service problems have been negligible and, more important, owners are happy with their choice. After living with the car we can see why such a result is inevitable. /MT

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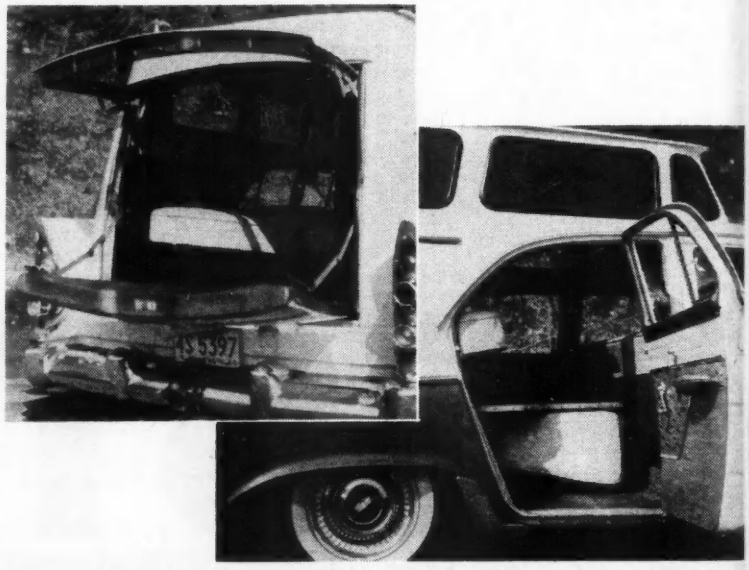
Room at the To

Two-story turnpike sleeper is customized from '56 Dodge and '59 Studebaker.



Wooden bulkheads stiffen the sheet metal modifications, and masonite is used for interior panels. Seats are adjustable to a reclining position. Overall length has not been changed but the height is increased two feet.

the Top

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MIDWEST MOTORISTS will be surprised this summer when they see this turnpike sleeper bearing down on them. Built by Minneapolis truck driver John Swanberg, the two-story '56 Dodge sedan has a '59 Studebaker station wagon top and rear door grafted on.

Swanberg built the hybrid because he wanted room to stretch his legs on long trips. After making a plastic model (by combining two hobby kits) Swanberg looked over new sedans and station wagons to see which would best fit his plans. Not finding exactly what he wanted, Swanberg designed his outdoor car on the '59 Dodge.

Last September Swanberg removed the Dodge's trunk and roof. Using cardboard templates, Swanberg cut 16-gauge steel sides to the pattern and riveted them to the Dodge body and roof. Then the Studebaker wagon roof and rear doors were attached to these sides. Wood bulkheads stiffened the sheet metal. The masonite interior panels were screwed to the bulkheads. Swanberg upholstered the trim panels in blue artificial leather.

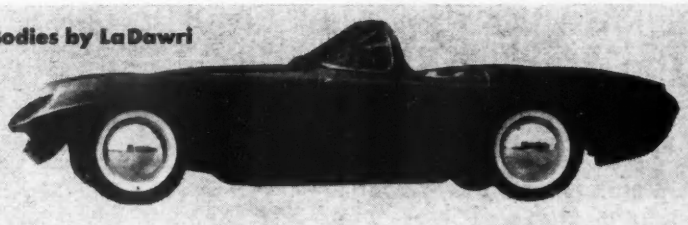
All work — even upholstering and painting—was done by Swanberg himself. His hardest job was on the seats, which had to be rebuilt three times before Swanberg got what he wanted. Each seat is individually adjustable from vertical to horizontal (for sleeping).

Swanberg ticks off these advantages of his turnpike sleeper: overall length is not changed from the original sedan dimensions, while height has been increased about two feet. Handling qualities are nearly the same: the superstructure doesn't add enough weight to make the car top-heavy. Acceleration is slower, but sharp cornering produces no excessive lean. Only mechanical change was addition of overload springs.

Figuring the time (500 hours) and money ($1000) he has in the car, Swanberg feels it is an excellent investment, because at last he has the car he's always wanted. And, says Swanberg, "In this car there's always room at the top."

—Photo Story by Tom Probst

Bodies by LaDawri



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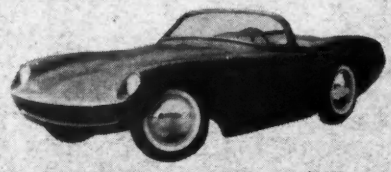

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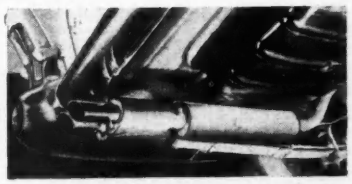

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SPARK PLUGS

continued from page 63

suffice. This will, however, change the heat range of the plug about a quarter of a step on the hot side, which may or may not be desirable depending on how close to "too hot" the plug was in the first place. The reason for this is simply that the two gaskets will not conduct the heat away from the shell as fast as one, particularly if there is any grease or grime between them or between the plug and the gaskets or the gaskets and the head. Which brings us to the next point. . . .

With plugs as with any other part of the engine, cleanliness almost transcends godliness. Just because a plug is dirty is no reason to throw it away, even if there is evidence of misfiring. We're talking here about street plugs, not competition plugs, of course. After about 2000 miles a plug may well start acting up though it has not burned nor fouled with oil or carbon. Quite likely what has happened is that it has become lead-fouled through the use of heavily leaded fuel in urban traffic conditions. It is hard to detect but the evidence will show up in the form of light carbon streaks on the insulator showing where the lead deposits have conducted the spark. The condition can best be alleviated by sandblasting in a plug cleaner.

For some reason, probably failure to remove the blasting sand from the plug, sanding has acquired a bad name. This form of cleaning does not injure the plug but rather enhances its life if all else is in good condition. The author has used the same set of plugs for a full season of racing without failure by means of frequent cleaning.

This cleaning, however, should be done properly. The first step is to remove all oil and grease by washing both inside and outside in a solvent such as carbon tetrachloride, lacquer thinner or other good cleaning fluid. The plug must then be thoroughly dried and the surfaces wiped clean of any film that remains. Particular attention should be paid that the threads are clean and clear of all foreign matter. The blasting should last only long enough to clean the electrodes and insulator, usually no more than two or three seconds at the most. Any and all particles of sand must be removed from the space between the shell and the insulator. Most of this can be done with a blast of air. Any grains remaining either around the center electrode or between the shell and the insulator should be carefully dislodged with a fine, stiff wire, taking care not to chip the porcelain.

After cleaning the plugs, gap them to the proper openings. There is no hard rule governing plug gaps in street plugs other than the manufacturer's recommendations. This, too, is a matter of experimentation. Generally speaking, the higher the compression ratio the narrower the gap due to the greater resistance of the spark to jump under high pressure. The best rule of thumb is that a wide gap is best for starting and low-speed operation while a fairly tight gap is best for high-speed running and when a magneto is used. Most engine manufacturers recommend a gap of between .028 and .032 of an inch. High-performance engines will run best with plug gaps of .022 to .025 of an inch. When setting gaps on regular plugs, the side electrode and *only* the side electrode should be bent. If the gap is to be widened a proper plug-gapping tool should be used, not a pair of pliers or other makeshift aid. To close the gap either the tool may be used or the electrode can be gently tapped against some solid surface such as the cylinder head. On those plugs with a side electrode (such as the Champion racing series, in which the ground electrode is pierced through the shell), adjustments must be made only with the special tool made for this job. Gaps for these plugs are quite short, from .015 to .019 of an inch. In checking the gap of a plug the feeler gauge with blades is only a makeshift; the proper tool is one which uses wire for feelers.

Before re-installing plugs be sure that the plug holes are immaculately clean and free of grit. It is preferable to use new gaskets when installing plugs, be the plugs themselves new or used. The smooth side of the gasket is placed against the plug with the seamed side toward the head. A reversed gasket will lower heat transfer by five degrees, resulting in what amounts to a hotter plug.

The final step is in tightening the plugs. If at all possible use a torque wrench and set each plug with proper torque for its thread size and the cylinder head material. These torque ratings have been established by the plug manufacturers through years of experience and have a direct bearing on heat transfer. Briefly stated, the settings for a 10mm thread in a cast-iron head are 14 foot/pounds and in a cold aluminum head, 11 foot/pounds. For a hot aluminum head the setting is a mere 7 foot/pounds. For the 14mm plug these settings are 30, 27 and 23 foot/pounds respectively and for an 18mm thread the readings should be 34, 32 and 28. If a torque wrench is not used, the plugs should be screwed in finger-tight, then tightened as follows:

Thread Size	Cast Iron	Aluminum (cold)	Aluminum (hot)
10mm	1 turn	⅞ turn	¾ turn
14mm	¾	¾	⅝
18mm	¾	¾	½

These figures apply to new gaskets only. Reduce by one half or more if old gaskets are used.

Spark plugs may be small but they're important. They're always on the firing line. /MT

Classic Comments

IT'S ALWAYS A SHOCK to place a perfectly restored classic in a garage for six months and then attempt to drive it. We know from experience (and it's all sad) that time deteriorates an automobile almost as much as constant use.

Though a good set of tubes won't lose all their air in a six-month period, and a good battery might turn an engine over after this period of time, the amazing thing is the way brakes, gears, clutches and engines become defective from non-use.

The storage of a car for any extended period requires extensive preparation and precautions. Preventive measures should be taken to avoid rust in the cooling system. Spark plugs should be removed and cylinders filled with oil—again, to prevent rust problems. Gasoline should be drained so the tank and lines don't become gummy. Leather upholstery should be treated with neat's-foot oil to avoid cracking.

Tires as well as wheels will be saved by placing blocks under the car so that the wheels do not support its weight. Batteries should be charged from time to time. Most important of all, mothballs should be strategically placed in any compartments upholstered in fabric. Windows should be closed because this is a more effective treatment against moths. If the car is stored in an area within 50 miles of a large body of salt water, the paint as well as the chrome should be covered with a good grade of oil.

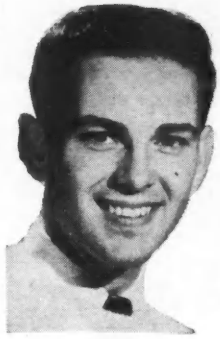
None of the foregoing will prevent major difficulties resulting from storage. We don't know why a clutch goes bad or a gear tooth breaks on a car which has been inactive. Something undoubtedly occurs which causes the breakage when it is fired up after months of inactivity. If any readers can explain this phenomenon we'd sure like to hear from them.

WITH CLASSICS BECOMING HARDER and harder to find, more of the really bad wrecks are being restored. A few years ago collectors wouldn't buy certain machines because they needed too much work. Today, in some sections of the country, almost anything which is a true classic has value and will find a home. This applies even to those cars where all the wood in the body is rotten.

Wood can be destroyed by beetles, termites, woodrot and, of course, cracking from age. Its replacement is expensive, tedious and exacting, especially on older cars where the wood was the frame to which sheet metal was nailed. It should always be replaced with a hardwood similar to that used by the manufacturer. If you are in doubt, oak is always a satisfactory substitute.

Woodrot can be caused by continuous dampness. Dryrot is generally found in hot, arid areas. In either event you must chisel out the affected portions and replace the wood with new stock. A few cars have been infested with termites and beetles. After removal of the bad portions, be sure to have the entire remaining pieces treated by professional exterminators.

—Robert J. Gottlieb, Classic Car Editor



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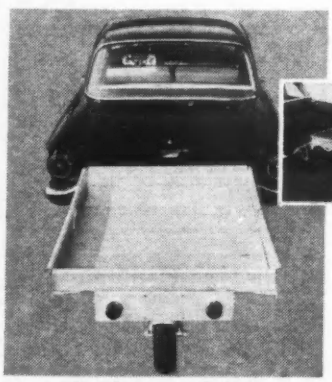

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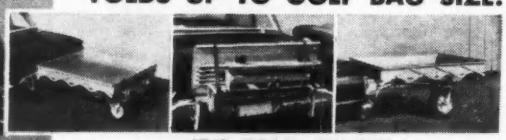

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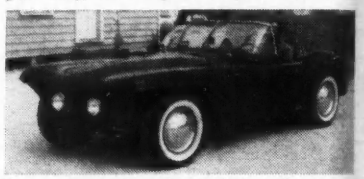

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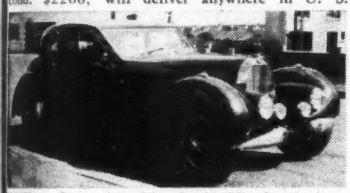

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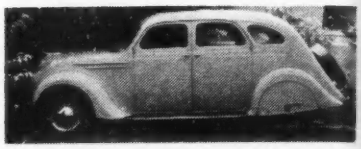

Drive it anywhere. Owner's manual included. Leslie Spencer, 7702 Phlox St., Downey, Calif.

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SELL OR SWAP

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"You bought a WHAT . . . ! ?"

INDY!

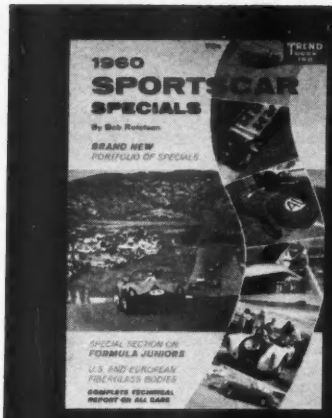
continued from page 59

Despite the proven worth of the Offy powerplants, two cars powered by modified Chevy V8 engines were present to try for a spot in the 33-car field. Bruce Crower crewed the Helse Special with a V8 installed offset to the left and tilted to the right in a Kuzma chassis. Driver Al Keller was turning some 138-mph practice laps, but the car was plagued with a lot of little troubles such as cracked header pipes, oil leaks and plug fouling. It was also very difficult to start on the cold plugs and the engine had to be warmed on hot plugs which were then changed to those of the proper heat range for fast laps. This took time, especially on the left bank as exhaust headers and a frame tube cramped working quarters. A very rainy last weekend of qualifying found the Helse Special in line to run but despite an added hour of track time on the last day, they were just too far back in line.

The other Chevy-powered car was a beautiful piece of hand workmanship executed by its owner, Chuck Cheneworth of San Diego. Construction of this car began much too close to race day to really complete it, but it was hauled to the speedway anyway, where final assembly took place. They didn't run out of time—they just started too late—and though there were several top drivers who offered to shake the car down for them, it was just not ready when the track time was available.

Weather, that old bugaboo of the Middle West's unpredictable springtime, cut into the two weekends set aside for qualifying. Total time available for 10-mile qualifying runs amounts to 26 hours if there are no hold-ups for wind, weather, yellow lights, or oil on the course. Handmade, highly-tuned, temperamental machinery such as these Indy cars have their problems, and all cannot possibly be ready on the first weekend of qualifying. In fact, if they were it would be quite a mess out there trying to line up 66 cars along the pit wall. In all fairness to car owners and the men who slave day and night to prepare these machines, plus the original cost, the entrants should have some guarantee that they will have 26 hours available for qualifying, even if it means keeping track of the hours lost due to weather conditions and making these up during the week days between qualifying weekends. Entry fees and one set of tires will shoot the better part of a thousand-dollar bill, and every minute of rain slowly and surely flushes all the expense and preparation down the drain.

Prior to the 1960 race, car owners voted to make a change in engine displacement for the 1963 racing season. The new formula will be for smaller powerplants somewhere in the 180- to 230-cubic-inch-displacement range, but the exact size has not yet been determined. /MT



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Seat Cover King.
Central
Bowl Auto, 1160 E. Van Buren
Auto, 2736 N. Campbell
Service, 3390 E. 22nd
Seat Cover King, 941 N. Stone

ARKANSAS
Quality Auto, 242 Main
Jay Cohen, 507 Main St.

CALIFORNIA
Miller, 6445 E. Florence
Natl. Auto, 1113 Howard
Auto, Park Ave. at 17th
's, 1716 N. Long Beach
Payner Serv., 15729 Atlantic
County Auto, 524 W. Valley
Allied Auto.
Lakewood.
BEACH: Sunray Auto Supply,
Coast Highway
Mufflr Service,
Pacific Coast Highway
Leonze Auto Supply
Lynwood, Maywood
Lucky Auto Supply.
Inglewood, Belvedere,
and Whittier
Motors, 3365 Century
Auto Stores, also
Hayward, Berkeley,
Leandro, Richmond.
Redwood City, San Rafael
Oceanside Auto, 322 Hill
Larsen's, 412 Oak St.
Capitol, 1620 Broadway
Scotty, 365 "G" St.
Big Wheel, 3762 El Cajon,
3640 Rosecrans, and
Chula Vista
Colma, 1517 Truman
Automotive Proc.,
Sugar's, 138 E. Santa Clara,
Santa Clara and
Jose, also Sunnyvale
Ed's Auto, 1332 Fourth St.
Muffler Shop, Park & Bellomy
Len's, 2323 Lincoln
No. Cal. Auto, 437 "A" St.
& D Brake, 2017 W. 17th
Ferguson's, 516 Main

CANADA
D & D Tire Ltd.
Ave.
MINSTER, B.C.: Western
n, 315 Columbia
B.C.: Fyrless Auto Access.,
Langley
C.: D & D Tire Ltd.,
Second St.
MANITOBA: Acme Auto,
Ave.

COLORADO
Auto, 9523 E. Colfax
Empire, 410 W. Colo.
, 775 Chempa St
Joe's, 2539 S. Santa Fe
W & M Auto Supply
W & M Supply Co.,
Avenue
Auto,
Grove Pk.
Auto, 201 N. Santa Fe

CONNECTICUT
Auto Stores, 323 Albany
Henry's Auto, 99 Whalley
Muffler's Auto, 757 1st Ave.
Montambault's,
Avon.

FLORIDA
Volusia, 936 Volusia
Carports, 570 College
Modern Mof., 2402 Main
Auto Stores Florida, Inc.,
E. 11th Ave., and
serve you

GEORGIA
Auto, 400 Decatur S.E.
Auto, 4176 Glenwood
Modern Muffler, 538 W. Bay
Perry-Anderson Auto Sup.

HAWAII
Automotive Industrial
, 705 S. Queen

IDAHO
Bill's Auto, 1320 Front St.
Auto, 1322 Idaho St.
Wayne Auto, 2923 Cleveland
Ed. Art's, 754 First St.
Advance Dist., 2nd & D St.
Auto Supply, 440 E. Clark
Parts Service Co.

ILLINOIS
Wheel, 5954 W. Addison
Bentleyware, 1900 S. State
Main Parts, 30 S. Hazel St.
Henry Randolph, 304 E. Wood
W. Atlas Auto, 102 E. Wash.
Hilton Auto, 333 St. Louis
Muffler, 59 Kimball St.
Checker Auto, 154 W. Main
Auto Parts, 405 S. Adams

INDIANA
Auto Sup., 3886 Broadway
Washington Auto Parts,
Washington
Guarantee, 425 State

IOWA
Mt. Pleasant, 630 2nd S.E.
Drum Auto, 413 15 W. 3rd
United Auto, 410 13th St.
Auto Supply, 901 Sycamore

KANSAS
Bryant's, 211 E. 8th St.
Wallner Elec., Box 93
Spring Serv., 672 Bdwy.
Tire, 300 W. 6th St.

KENTUCKY
Corp., 225 Steedley Dr,
Consolidated Sales,
Johnson St.

LOUISIANA
Marks, 1917 Scenic Hwy,
Muffler Mart, 419 19th
Muffler Shop,
2232 Plank
Marks Seat Cov. Ctr.,
and 610 Broad
Lite Model Auto Parts,
Jos St.

MARYLAND
BALTIMORE: Vicioni Auto, 2615 N. Point
LAUREL: Hi Gear Tire, 384 Domer Ave.

MICHIGAN
DETROIT: Hot Rod Shop, 8249-Grand River
DETROIT: Great Western,
15821 Grand River
GRAND RAPIDS: Remes, 2601 S. Division
IRONWOOD: Automotive Supply,
100 N. Mansfield
KALAMAZOO: Hartman, 616 Portage
ROSEVILLE: United Auto, 20712 Gratiot
SAGINAW: Saginaw Hot Rod, 606 Lapeer

MINNESOTA
AUSTIN: Amer. Auto, 1303 E. Oakland
AUSTIN: Bundy Auto, 609 Hiway 218 S.
MINNEAPOLIS: Big Wheel, 1418 E. Lake

MISSISSIPPI
VICKSBURG: Nick's, 1733 Washington

MISSOURI
KANSAS CITY: Arrow Auto,
5522 Independence
KANSAS CITY: Sterling Tire, 600 E. 31st
KANSAS CITY: Chrome Automotive,
4318 Truman Road
ST. LOUIS: County Auto,
6910 St. Charles Rock Road

MONTANA
BILLINGS: Hines Motor. Also Bozeman
GREAT FALLS: Speed Acces., 812 1st

NEBRASKA
LINCOLN: Ben's Auto, 2020 "O" St.
LINCOLN: Hanks Auto, 216 S. 11th
LINCOLN: Speedway Motors, 1719 "N"
OMAHA: National Auto, 1102 Harney
OMAHA: United Auto, 2060 Farnam St.
OMAHA: Wolfson, 3808 Leavenworth

NEVADA
LAS VEGAS: Nevada Auto, 1401 S. Main

NEW JERSEY
CAMDEN: Rem Auto, 22nd & Federal
NEW BRUNSWICK: Calif. Speed and
Sport, 298 Jersey Ave.
PASSAIC: J & S Dist., 257 Monroe St.
PATERSON: House-of-Chrome,
187 Paterson St.
SUCCASUNNA: Frank Smith, Hway 10

NEW MEXICO
ALBUQUERQUE: Ace Auto, 1513 S. 4th
ROSWELL: Roswell Mot., 204 N. Virginia

NEW YORK
BROOKLYN: Brooklyn's House of Chrome,
2639 Atlantic Ave.
BROOKLYN: Jet Auto Supply, 1772 86th
BUFFALO: Sport & Custom, 316 Ramsdell

NORTH CAROLINA
BURLINGTON: Sumner Auto, 300 Front

NORTH DAKOTA
FARGO: Gellers Auto, 120 Main Ave.

OHIO
CINCINNATI: Pushin Auto, 5805 Madison
CLEVELAND: United, 12524-26 St. Clair
COLUMBUS: Fullen Auto, 750 W. Broad
DAYTON: Brockman, 112 Valley St.
HAMILTON: Rose Auto, 411 S. 2nd St.
TOLEDO: Baumans Auto Sup., 3341 Dorr

OKLAHOMA
OKLAHOMA CITY: Champion Auto,
1341-43 W. Main St.

OREGON
EUGENE: Pacific Auto, 88 W. 10th
EUGENE: Walker Auto, 964 Charnelton,
also in Cottage Grove, Roseburg
and Corvallis
PORTLAND: Coast Auto, 110 NW Bdwy.
PORTLAND: General Auto, 809 NW Flanders

PENNSYLVANIA
ALLENTOWN: Cooper's, 1825 Roth
HARRISBURG: Chelsea, 26 N. Cameron
PHILA.: H. R. Sales, 1204 W. Girard Ave.
PITTSBURGH: Brougher's, 5429 Mifflin
READING: Seward's, 434 N. 6th

SOUTH CAROLINA
DARLINGTON: Loew's Tow Bar, Rt. #1

TENNESSEE
MEMPHIS: Montgomery Auto, 230 Union
NASHVILLE: Berlin's, 1610 W. End Ave.
NASHVILLE: Brown's Auto, 820 8th Avenue S.

TEXAS
AMARILLO: Baker, NE 8th & Ridgemere
AMARILLO: Custom Car, 713 E. 10th
AUSTIN: House of Seat Covers and
Mufflers, 10th & Lamar
CORPUS CHRISTI: Muffler Shop,
4510 Ayers & 723 N. Brownlee
FT. WORTH: Kragen Auto Sup., 5 Stores
GARLAND: Murphy Co., 614 W. Garland
MIDLAND: Seat Cover Ace, 2706 W. Wall
ORANGE: Marks, 205 Green
SAN ANTONIO: Automotive Jobbers,
501 San Fernando
TYLER: Muffler & Custom, 1039 Erwin

UTAH
SALT LAKE CITY: Hollywood Muffler,
2354 S. State St.

WASHINGTON
BELLINGHAM: Gordon's 929 State St.
KENNEWICK: Bridge Pumps, Box 556
SEATTLE: Auto Access., 1516 N. 11th
SEATTLE: Allen Auto, 9810 14th Ave SW
SEATTLE: B Boys Auto, 10304 Bothell
SEATTLE: Burien Auto, 15411 Ambaum
SEATTLE: Schucks, 7 stores to serve you
SPOKANE: Garland, N 3622 Division
SPOKANE: Thrifty Auto, N 2001 Division
TACOMA: AA Auto Pts., 3802 Pacific
TACOMA: Bragets Auto, 1136 Pacific

WASHINGTON, D.C.
Custom Speed Shop, 733 Main, S.W.
Hi Gear Dist., 1811 Rhode Island, N.E.

WISCONSIN
LA CROSSE: Howard Neff, 1103 LaCrosse

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